AMERICAN MACHINIST

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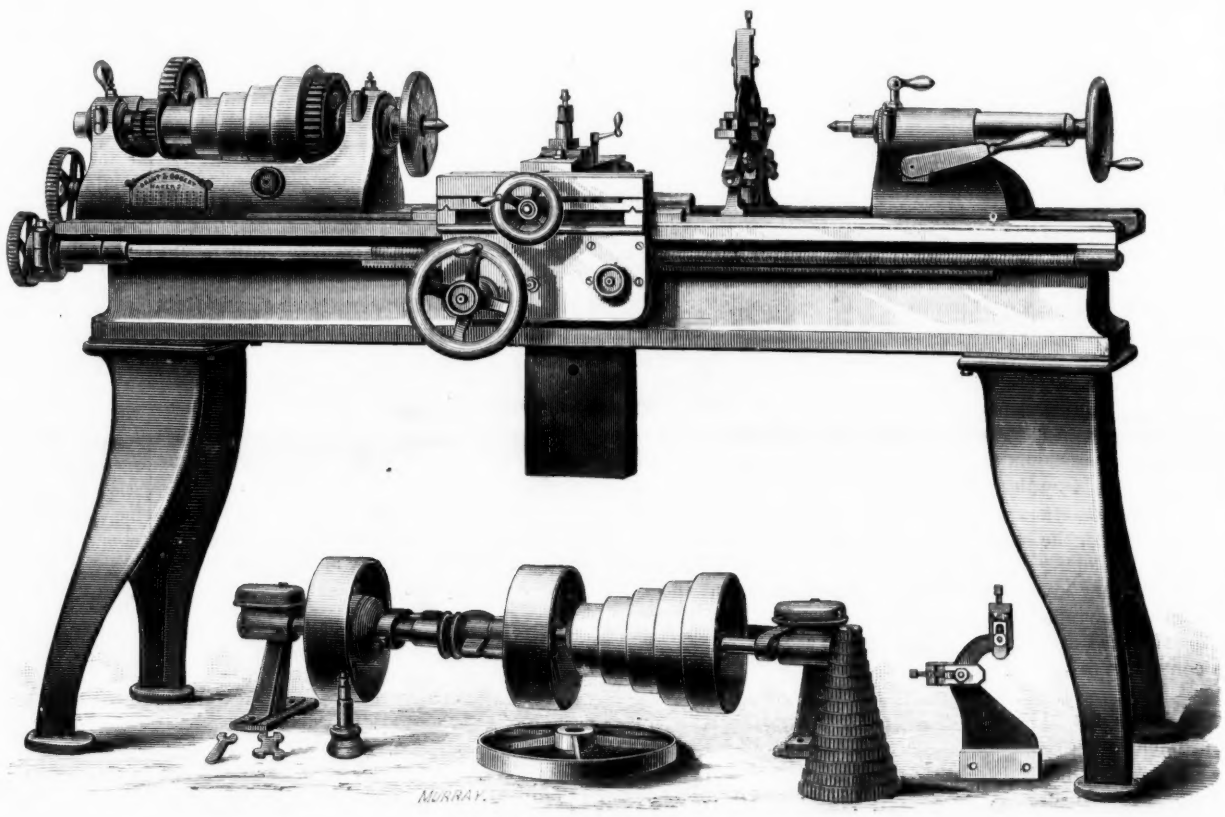
ENTERED AT POST OFFICE, NEW YORK, AS SECOND CLASS MATTER.

New 14″ Swing Engine Lathe.

The engraving on this page represents a 14″ swing engine lathe recently brought out as one of their standard line of machine tools, by Grant & Bogert, of Flushing, L. I. This lathe represents advanced ideas in machine tool design and construction, embodying the knowledge of many years' experience gained in the practical work of manufacturing this class of machinery. It is brought out and offered by the builders in the belief that those who buy and use machine tools will appreciate one of this class, in which no reasonable pains or material are spared where the addition of either would go to improve efficiency.



NEW 14 INCH ENGINE LATHE.

The bed is deep and of unusual strength and width, the latter insuring stability to the head and tail stocks, and the whole a firm and solid support for all the working parts.

The head stock is of extraordinary length, which affords room for a five-change cone pulley, with ample belt face, and also gives length to the spindle, insuring stability of motion and preventing chattering, particularly in doing heavy work in the chuck or on the face plate. The boxes are lined with the best Babbitt metal, tightly compressed in the shell before boring and fitting, it being the experience of the builders that, with journals of proper size and correctly fitted, this metal is superior to anything that can be used for the purpose. The boxes are inclosed in the jaws with caps rigidly bolted to the jaws, to prevent all tendency to play or to work loose, the adjustment being made, when necessary, by means of a fine-threaded, centrally-placed screw, which abuts against a steel shoe, resting on the top of the upper half of the box.

The spindle is pierced with a central hole, $\frac{5}{8}$″ in diameter, for convenience in working up full-length stock, and for other purposes for which this construction is found desirable. The forward journal of this spindle is $2\frac{1}{4}$″ in diameter by $3\frac{5}{8}$″ in length, and is not shouldered over the box, but is the largest part of the spindle. This journal is hardened, after which it is "lapped" to as nearly perfect condition of roundness and smoothness as is practicable, thereby insuring steadiness of running and freedom from jar. The thrust of the spindle is held at the back bearing against a broad, hardened steel collar, the adjustment being made by two screwed collars on the end of the spindle. This affords a ready and perfect means of adjustment, with no possibility of jamming the shoulder of spindle against the box flanges.

The back gears are of extra width of face and the most approved epicycloidal form of teeth, and to prevent the tendency to *cumulative* chattering, the pitch of the gears at the front end of the head stock is different from the pitch of those at the back end. By this means the tendency to isochronal jar, so often noticed when running on large work, is in a great degree obviated.

The yoke inside the head stock, which carries the idle pinions by which the direction of traverse of the carriage—as for cutting right or left hand screws—is changed instantly through the operation of a single lever, and without the necessity for using an outside stud gear, is arranged with outside bearings for pinion studs, affording long surfaces for wear, and holding the pinions steadily to their work.

The tail stock has long bearing surface on the ways, and is strongly and substantially made. It is locked and unlocked from the ways by the use of a single lever, which operates an eccentric attachment underneath it. The spindle bearing is long. The tail spindle is $1\frac{3}{8}$″ in diameter and is locked by a screw in connection with a split in the front end of the bearing. On the back side of the tail stock is arranged a neat cast iron shelf adapted to swing into convenient positions for holding a lamp, oil can or other accessories, while on the front side is arranged an oil cup and center oiler.

The slide of the taper attachment is fastened by means of a square-headed screw, located so as to be come at readily. This screw, which for convenience in using is placed vertically in the back end of the carriage, is pointed or beveled at the end, and in being turned down to lock the taper slide the beveled point comes in contact with a correspondingly beveled shoe, which is by the operation forced against the slide, thus securely fastening it in any desired position. A slight turn of the screw—which is adapted to the use of the ordinary lathe wrench that is always at hand—releases the slide.

The slots in the carriage are milled to standard size, so that where several of these lathes are in use in one room, any attachments with which they may be fitted will be interchangeable between them. The gauge screws for the carriage slide, which in this class of tools usually cause trouble by becoming filled with dirt so that they must be removed and, as well as the nuts, cleaned as often as it is advisable to use them, are provided with sleeves that effectually exclude all foreign substances, leaving them ready for use at any time, without delay. Upon the outer end of carriage is arranged an adjustable water-can rest, by the use of which the drip can be brought to the work where it is the most desirable.

The lathe as here illustrated is fitted with a weighted rest, and is provided with an adjustable-jaw back and follow rest, two tool posts, two face plates, all gears necessary to cut screws from 3 to 48 threads, the necessary wrenches and a counter shaft, hangers and pulleys, the latter being fitted with an effective friction clutch which is noiseless in its operation. When desired, however, they are fitted with a gibbed rest, in which case an improved "doctor" rest is furnished. This is fitted and doweled in place, and made with two cast iron cans, the one for water and the other for oil, which forming part of the rest are always in place and ready for use.

Throughout, the workmanship of these lathes is excellent, the greatest pains being taken to scrape all wearing parts to perfect bearing, as well as to fit the head and tail stocks, by scraping, to the most accurate alignment of the spindles, and to bring the alignment of cross slide at right angles to the spindle alignment.

Every attachment is complete and ready for immediate use, and in all its parts and appliances the lathe presents a neat and creditable appearance.

Comparisons Between High and Low Speed Engines.

BY CHAS. A. HAGUE.

The challenge thrown out some time since, against all comers who do not indorse high speed engines, not having been responded to up to the present time, I propose to enter the arena and cross swords with the high speed parties, on behalf of engines of a moderate rate of rotation, especially referring my remarks to medium and large-sized motors; basing the issue on a consideration of the two types of engines generally recognized as short stroke and high rate of revolution, as opposed to those of long stroke and moderate speed. And this comparison I wish to make mainly upon two grounds, viz: economy of steam and durability.

While allowing to the high-speed advocates, all those refinements in construction, such as hardened and ground journals, extraordinary areas of wearing surfaces, specially prepared to answer their respective purposes, which are found to be necessary in real high speed engines; together with the proportionlely heavy framing and fastenings capable of withstanding the rapidly recurring shocks and strains of high pressure and heavy work. I shall insist upon employing a proper quality of steam in the low speed engine, that is, steam sufficiently super-heated to prevent cylinder condensation. It must be, of course, admitted that the same quality of steam is to be allowed in both cases, and to place the comparison upon as fair a basis as possible, I will suppose both motors to be operated under as nearly similar conditions as can be obtained. In carrying forward this idea, the cylinders are assumed to be of the same diameter, with their stroke and speed so proportioned as to give the same piston travel per minute; then the same mean pressure will produce equal gross power in both cases, the grade of expansion, although varied slightly by the relation of the clearance to the volume swept through up to cut-off, being so nearly the same in both, that the degree of super-heat need not be changed. One very important factor in the problem of steam economy in the cylinder, is the perfect dryness of the exhaust steam; for by this, we are assured of the fact, that there is expelled from the cylinder no more latent heat than is due to the counter pressure, and to secure this benefit, it becomes necessary to operate

the engine so that the exhaust will be somewhat superheated, but the relative value of latent and sensible heat is such, that this can well be afforded. Now, if coupled to this advantage, the percentage of super-heat in the initial steam is proportioned to the ratio of expansion, so that it will instantly re-evaporate all the steam condensed for work at each stroke, and preserve the cylinder temperature slightly above that due to dry saturated steam at the initial pressure, the interior of the cylinder will be at all times perfectly dry, and the wasteful cumulative effects of expansion will be avoided.

The philosophy of employing super-heated steam is, that it must heat the iron to a degree, that, with the assistance of the extra heat held by the initial steam entering at each stroke, the mist attempting to form during expansion, will be completely evaporated by the time the terminal pressure is reached. In considering this, it appears, that during the latter part of the stroke, the heat must come from the iron, also, that the dryness of the terminal steam determines whether a large percentage of the cylinder heat shall be rendered latent by a moist exhaust, or whether an insignificant amount will be added to a dry exhaust. The question now becomes prominent, that if these internal radiating surfaces are insufficiently available by reason of too great a diameter of cylinder in proportion to the volume of contained steam, or the briefness of the time of contact, the heat from the cylinder walls will fail to penetrate the mass of moist steam far enough to ensure perfect dryness before the release valve opens. All heat rendered latent and carried off by moisture during exhaust, is so much expenditure without that return in work, which would be realized from evaporation taking place before the release opened.

We are well aware that the advocates of high speed engines urge, that the shorter the time the steam is within the cylinder the less will be the condensation; but it can be offered with equal and perhaps greater propriety, that the steam might be expanded and released too quickly to allow the transmission of heat necessary for keeping the expenditure of latent heat within the most economical bounds. In support of this view we present the fact, that pumping engines with very moderate—we might say slow—rate of motion with cylinder proportioned very long for the diameter, are in daily operation developing extremely high duties. It is true they are steam jacketed, but the closeness of the radiating surfaces and the slowness of the motion, no doubt materially contribute to the general utilization of heat.

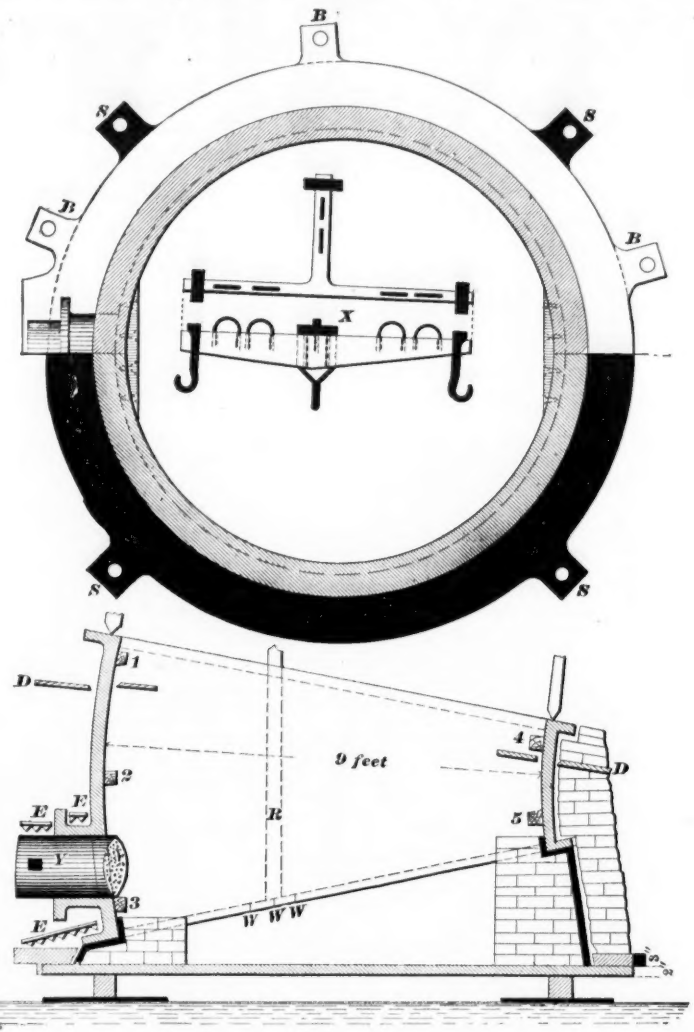
The examples of engines to be compared may be assumed to be of 26″ diameter of cylinder, one of 42″ stroke at 100 revolutions per minute, and the other of 60″ stroke at 70 revolutions. Allowing the clearance or waste room in the long stroke to be $\frac{30}{1000}$, and considering that the actual volume of clearance in the short stroke must be at least as great in cubic contents as in the former, the figure for the latter would be $\frac{28}{1000}$, or an increase of 40 per cent. In the short stroke this amounts to 127,200 cubic inches of the waste room per minute; and in the long stroke to 89,040 cubic inches per minute. If these clearances are not completely filled by means of compression, whatever is lacking in density between the tops of the compression curve and the initial pressure, must be made good from the boiler. Considering this fact, also, that the chances are decidedly against the waste room being filled by compression in practice, it is very likely that a point will be scored against the short stroke in this particular.

With reference to durability, especially in large engines, the reversal in the direction of motion of the reciprocating parts, in the cases we have cited, occurs 8,400 times per hour with the long stroke, and 12,000 times with the short stroke, placing the cranks at the dead centers with the full initial pressure exerted directly against the crank pin and main journal, thus placing the latter engine under the straining and springing conditions 3,600 times per hour in excess of the former. In the operations of the valve gear, the same comparisons are presented, the same excess in the number of movements, within any certain length of time, occurs in producing equal power.

If a practical rotary engine could be devised, in which the benefits of expansion could be realized, and also in which the rotative effect upon the shaft could be produced without reciprocation, and with continuous effort in one direction upon the piston or driver, a large percentage of friction and the wear upon the principal members of the machine could probably be avoided. In following this idea, the fewer the reciprocating movements, to produce a certain belt speed at the band-wheel rim, the nearer we should approach the rotary principle as far as transferring the energy of the steam into rotary motion is concerned. But of course in pursuing this path we must not ignore many other and vital factors in the matter, such as the economical use of steam, regularity of rotary motion, impractical magnitude of the engine, and others of greater or lesser importance.

The advocates of high speed claim, among other things, a smaller and therefore cheaper engine, but it seems to me that this position is not altogether well taken; for in place of what they term an excess of pig iron, they are pretty sure to substitute more expensive workmanship, made necessary by the conditions which surround them in their undertaking. A steam engine, as a machine, can not be too well made, but when interest on investments is considered in connection with expenses for repairs, it behooves the steam engineer to so proportion these two items, that the total outlay per annum will be the least possible, and from this it follows that in a system of engineering where the risks of damage are increased, the soundness of the policy of saving a few dollars in mere bulk of material, and expending it in super-refinements of construction, remains still to be established, and this in the face of a possible—not to say probable—deflection from the straight line of true steam economy.

The Madrid International Exhibition of minerals, metals, pottery and glassware will be opened May 15.



MOULDING QUARTER TURN PIPES.

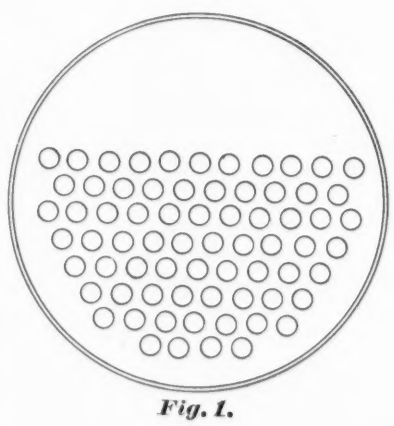


Fig. 1.

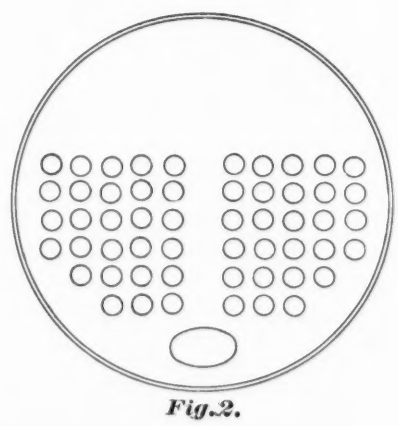


Fig. 2.

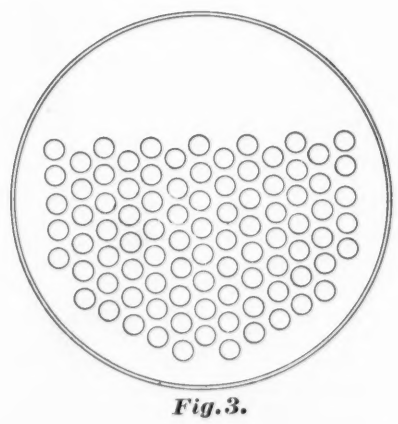


Fig. 3.

Different Methods of Arranging Tubes in Steam Boilers.

The accompanying engravings represent three methods of placing tubes in boilers, in reference to which, question 27, issue of Jan. 21, 1882, was asked and answered, and which we are requested to publish by several correspondents: The cuts, although not exactly like the sketches sent by our correspondent who asked question No. 27, show the three methods referred to. In them is represented boilers of the same size with the tubes arranged according to the three methods, and referred to by their numbers as here given. Fig. 3 it will be seen contains the most tubes, but they are so disposed as to obstruct the steam in its effort to rise to the surface. This method is but little used at present.

In Fig. 1 the tubes are much better arranged to allow of the escape of steam to the surface, but the number of tubes is not so great. This plan of arranging the tubes is adopted by many engineers.

Fig. 2 represents a method of placing tubes, advocated by William H. Hoffman in the AMERICAN MACHINIST of Nov. 8, and Dec. 6, 1879, which we think embodies good practice, and is the one we referred to as having the tubes placed in rows both horizontally and vertically. Mr. Hoffman also refers to tests of boilers with different number of tubes in our issue of Jan. 10, 1880.

Moulding Large Quarter-turn Pipes in Loam.

BY THOMAS D. WEST.

The versatility of loam moulding, or the aptness of the moulder to change from one course of treatment to another, is generally caused by some crookedness in the shape or form of the casting to be made.

The quarter-turn pipe pattern shown is a full wooden one, and the moulder who had it made must have well considered all the essential points before ordering it, as the cost of making such a pattern must have been considerable. As this job was a standard one, the full pattern would pay for itself in the saving of labor in moulding it in a short time.

Some readers of the AMERICAN MACHINIST will remember that I advocated the use of sweeps instead of patterns for making loam castings, and lest they may think there is a lack of harmony, they may also remember that I advocated their use when it was practical to use them, and not under all circumstances.

In the case of this quarter-turn pipe, there is not much more than two feet square, but would require a sweep of a different shape to sweep the mould with. Some will say the pattern might have been made a skeleton, or the pipe cast flatways by using a frame and sweep. I think, however, the plan shown is the most practicable.

These quarter-turn pipes were bolted to the large pipes cast in green sand, the manner of moulding of which was shown in the AMERICAN MACHINIST of Sept. 3, 1881. In making the rigging for moulding the quarter-turn pipes, the bottom plate and lifting ring were cast very thick, as they had to carry a heavy weight. Had they been lighter, they would have been liable to have sprung, so as to cause the mould or brick work to crack open.

The bottom plate is set solid on iron bearings. The lifting ring is then set on even and true, with the outside edge of the bottom plates, after which the full pattern is set on and blocked up in position as shown. The brick work is then built under it, using a light straight edge, and having for a guide the edge of the lower flange, and the inside face of the lifting ring to form the bevel joint, which separates the outside from the inside part of the mould. This joint also forms a guide to close the mould together by. When building this brick work under the pattern, it is built so as to form body, or thickness of wall, enough for the core to be built on at the same time, and the core is built up 2 or 3 courses, or layers of brick, so as to hold the pattern in place, and to form a guide by which to set the pattern back to finish building the core. The outside of the mould is built first, and then the core. To make a joint, so that the outside part of the

mould can be made to separate in halves, one half of the outside is first built and then an upright joint is made, using for a guide, the parting in the pattern. This joint is then oiled or blacked, after which the other half of the outside is built up.

After the brick work is built under and inside of the pattern as shown, the outside joint is loamed up and struck off with the light straight edge, using for a guide the edge of the flange and the inside face of the lifting ring, the same as when building the bricks up. The inside face of this lifting ring should be well oiled when it is first set on, to prevent the wet loam from sticking to it. When finishing up this joint, it is well oiled, and parting sand is sprinkled over it. Charcoal blacking, wet with water, could be used instead of oil, to make the outside part from the core joint. Charcoal is a very light substance, and when the water evaporates from it the charcoal returns to its original dusty state. Therefore when the charcoal blacking is brushed on to form a joint, the loam as it stiffens absorbs the water, leaving a thin layer of dusty charcoal which makes a joint between parts of moulds that are to be separated.

Some of these pipes had a branch cast on them, as shown. The small pricked loamed plates, *E, E, E,* which should be about 2 feet long, are built in with the brick work for supporting under and over the branch when the pattern is drawn. When the mould is being closed together to cast, after one half is closed on, the round core *Y,* is set in a round print formed about three inches deep in the main core. The other end of this branch core is bolted back against the half print, as shown. The brick work is not shown on the side of the pipe. This gives a clear view of the wooden pattern, loam plates and branch core. When the brick work is built up nearly to the top, a light cast iron ring, *D, D,* split in halves is set on to strengthen the brick work. The outside is then bricked up to the top, and the top joint made.

The pieces of wood, 1, 2, 3, 4 and 5, that are screwed on the pattern to hold the parts together, are unscrewed and taken off. The three winged cast iron cross, shown at *X,* has three chains hooked in the staples, there being two cast in each wing so as to give a better chance to regulate the lifting off. In the cut there is only one half ring shown. When the outside parts of the mould are ready to be separated, the lifting irons or bolts, are hitched in the three ring handles, *B, B, B.* Half of the mould is then hoisted a little, and should it not hang just right lower it down and adjust the stirrups till it hoists level.

The half mould when hoisted off is pushed around to the oven carriage and lowered on it, which operation is repeated with the other half. The patterns are now drawn, and the moulds finished and run into the oven to dry. The two half patterns are now set back in their original places, and pieces are screwed to the outside to hold the two parts together. The core is now made, and with a four winged cross hitched to the four handles, *S, S, S, S,* the bottom plate and core is also hoisted on an oven carriage. The pattern is drawn and the core finished and run into the oven to dry. While these are drying a top ring (not shown) is made to cover the top flange with.

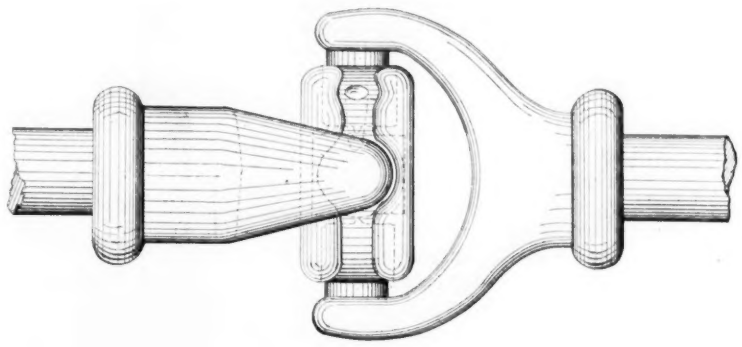
When all the moulds are dry the bottom and core are hoisted off first and set level where wanted. The outside halves are then placed on the bottom in their place and the top covering ring set on. The whole mould is now ready to be bolted together, which is done by bolting the top covering ring down to the bottom plate, the handle being used to bolt the two together. The mould is not sunk in the floor or pit, but is set up on the shop floor and the sand rammed up around it, a staging being used to pass the sand up.

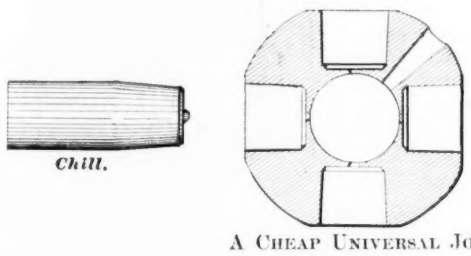
When the mould is cast, the bolts in the sheet iron curbing are taken out and the curbing taken away. Then, by digging around the bottom of the sand the upper portion will fall down.

W, W, W, show three gates cut into the flange, and *R* the upright runner, one of which is on each half of the mould. A flow off gate is on the low side of the pipe, and a feeder on the high side as shown. The castings made in this way were good and solid.

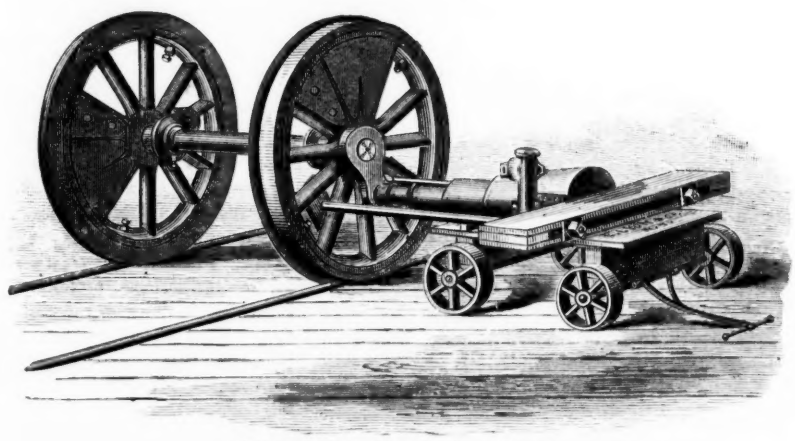
Improved Hydraulic Jack.

The engravings presented herewith represent the improved hydraulic jack and some of its adaptations, as made by E. Lyon & Co., 470 Grand st., New York. In this jack the valves and water passages are large to prevent the lodgment of any foreign substance that might find its way into the jack.

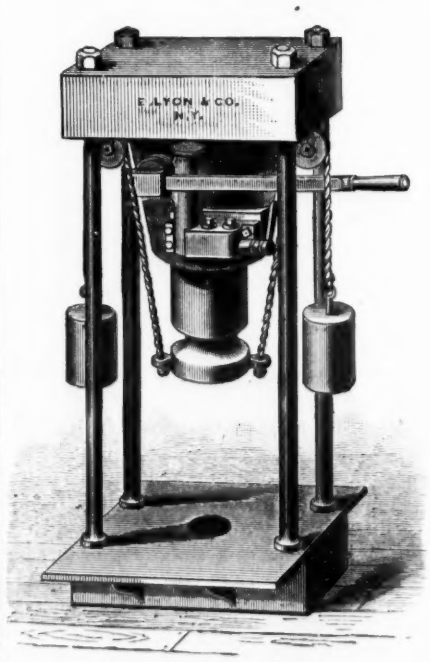




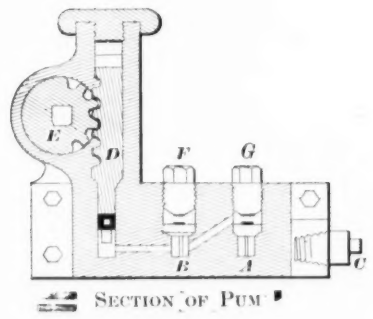
A CHEAP UNIVERSAL JOINT.



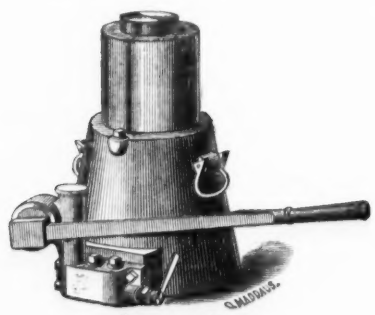
HORIZONTAL CRANK-PIN PRESS.



REVERSED JACK PRESS.



SECTION OF PUMP.



LIFTING JACK.

In the sectional sketch of the pump, *A* and *B* are the two valves, and *D* is the piston worked by the pinion *E.* *F* and *G* are the bonnets over the valves, and *C* is the end of the release valve which permits the water to flow from the pressure passage to the suction passage, through a connection back of the section shown.

A further improvement in the construction of these jacks is in the making of the cylinder and bottom of the jack in one piece, thereby doing away with a troublesome packing, and gaining about an inch in the lift.

These jacks are made in four sizes of 60, 90, 100 and 120 tons lift with the power of one man.

In the horizontal crank-pin press is shown an adaptation of one of these jacks to a special purpose, in which it will be seen that the pump is placed at right angles to the cylinder. This adapts the lever to be worked in a natural manner, by which means the effort of the operator is about double what it is when he is obliged to work the lever horizontally.

The reversed jack press represents one of these jacks arranged upside down, and fastened to the top of a frame, in which form it is used for a variety of purposes, such as forcing shafts into drums, wheels, etc., pressing embossing paper rolls, and a variety of purposes that will readily suggest themselves.

The other cut represents the jack in shape for general use.

These jacks are made with care, and, by the use of special machinery, are made interchangeable in their parts. They are adapted to be used in any position, and for almost any purpose in which it is required to exert a positive pressure.

Fire Protection against Electric Lighting.

A preliminary report based upon a thorough investigation as to the alleged dangers which may occur from the electric light has been made by Mr. Edward Atkinson, President of the Boston Manufacturers' Mutual Fire Insurance Co. The report, in part, reads as follows:

The danger of the arc-lamp itself, unless protected above and below, has already been stated, and is easily provided against. The dangers of contact with telegraph, telephone, or electric watch-clock wires, are too obvious and well-known to call for further warning, and are all readily guarded against in a well organized mill yard.

There is another danger which may also be easily avoided, but of which notice should be taken at once by every member using an electric arc-light, or contemplating such use; namely, it appears that, if the wire conveying the current is suddenly fractured while the dynamo-machine is in operation, the voltaic arc is extended while the ends of the wire are separating, through several feet of distance, varying according to the power of the machine; that is to say, if the wire is broken at such a place that one end can fall or separate from the other, the voltaic arc, or what would be called in common speech the electric spark, will follow from one broken end to the other, from one to six feet, according to the power of the current generated.

If in that distance the current should pass through or come in contact with wood or any combustible material, especially loose stock of fibrous material, fire would instantly occur. Such an arc might also, and probably would, be dangerous to life, if a person were exposed to it.

A fracture of the wire may be occasioned by the breaking of a belt, by the rupture of machinery, by a careless mechanic working in the neighborhood of the wire, and by many other causes which will be obvious to every member.

The greatest care should therefore be taken in choosing the position of the wires; and they should never be carried along the underside of the beams and transverse thereto, or in any proximity to belts, shafting or pipes.

The danger of suspended wires, exposed to the action of machinery, will be apparent. We are not yet fully prepared to suggest the true method of placing wires and protecting them; but, having indicated the danger, would ask suggestions from those who have used the electric light, in order to enable us to work out the proper instructions.

It may be suggested that the wires should be carried upon the walls out of reach of contact, and across the mill upon or protected by the beams, but insulated therefrom.

In dye houses, bleacheries, print works, paper mills, and other works where wet processes are in use, the greatest care must be taken that the two wires do not come in contact with the same surface of damp or wet wood, as in such case a cross arc may be formed upon the wood; and it appears that, if common salt or any other matter is in solution in the water, the danger of a cross arc upon the wood is very much increased. Salt being used in whitewash, a damp surface of wood whitened may be most dangerous. By "cross arc" is meant the diversion of the electric current from one wire to another across the damp or wet woodwork.

It is suggested that this danger may be avoided wholly by carrying the wire from the machine to a lamp over a separate beam or surface of wood from that on which the other wire is carried away from the lamp.

A Cheap Universal Joint.

We present herewith an engraving of a cheap universal coupling made of cast iron, and intended chiefly for agricultural purposes, where horse power is used. It may also be used for other purposes. The peculiar features of this coupling are the methods employed in its manufacture. The mould for the ball, or central part, is first made, with four steel chills, to form the holes in the ball, as shown in the sectional view. A sand core is inserted to make the ball hollow, to serve as an oil reservoir, to render the joints self-oiling. After the ball has been cast, the holes are washed with black lead, and placed in a mould containing the impressions of the two forks. The iron is poured, and the joint is thus made complete in the foundry in two operations. By this simple process this joint can be made at a nominal price. It is the invention of Edmund Garrigues, Massillon, O.

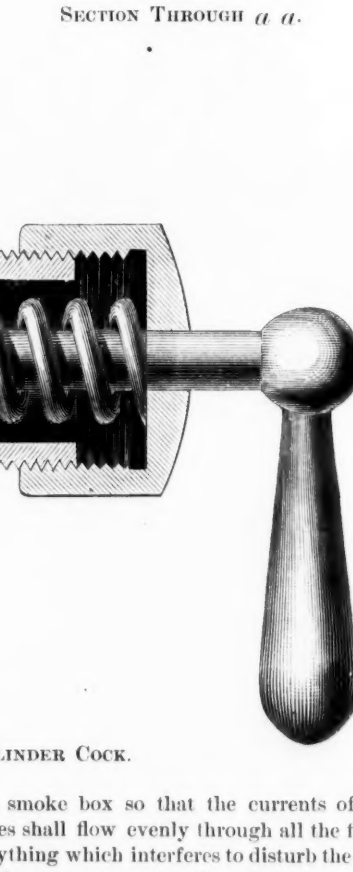
New Automatic Cylinder Cock.

Much difficulty is experienced from the accumulation of water in the cylinder of a steam engine when in operation, which from not finding ready egress frequently causes serious trouble by straining the connections, and sometimes results in knocking out heads and in doing other damage.

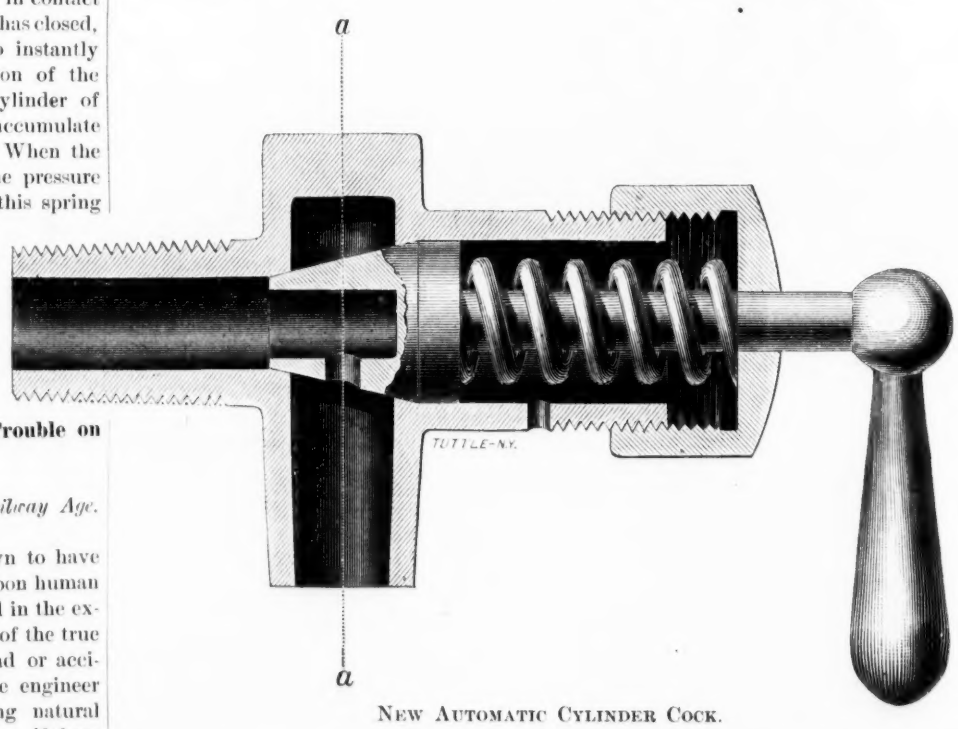
Especially is this true of traction engines, and high pressure marine engines, in which the boilers are subjected to change of position which causes a corresponding agitation of the water by which considerable quantities are liable to be entrained. The difficulty is however, substantially the same to a greater or less degree in the instance of any steam engine, being sometimes the result of over pumping, sometimes of hard firing or dirty water, and sometimes of causes not easy to determine.

The accompanying engravings represent a cylinder cock or relief, brought out by Minturn & Smith, Post Office address, box 209, Milwaukee, Wisconsin, and which is designed to automatically open and relieve the cylinder of water whenever it accumulates so as to be compressed by the piston to a pressure slightly beyond the ordinary steam pressure employed, and at the same time to serve all the purposes of an ordinary cylinder cock. As will be seen the valve may be opened and closed by the ordinary operation of the handle shown, thus serving the purpose of a cylinder cock as usually applied. In addition to this the valve is held to its seat by a spring which can be adjusted by the screw cap to any pressure desired. When thus adjusted for a determined pressure, should that pressure be exceeded, as by the piston coming in contact with water after the exhaust valve has closed, the increased pressure operates to instantly open the valve against the tension of the spring, thereby relieving the cylinder of pressure that otherwise might accumulate until serious damage resulted. When the danger is passed, that is, when the pressure has fallen to the normal point, this spring operates to again tightly close the valve.

This cock can be applied anywhere that an ordinary cylinder cock can, requiring no extra piping or fitting of any kind.



Section Through *a a*.



New Automatic Cylinder Cock.

Locomotive Engine Running—Trouble on the Road, &c.

By Angus Sinclair, *in the Railway Age*.

Trouble and affliction are known to have a purifying and elevating effect upon human character; difficulties encountered in the execution of work develop the skill of the true artisan; and trouble on the road or accidents to locomotives furnish the engineer with opportunities for developing natural energy, ingenuity, and perseverance—if these attributes are in him, or they publish to his employers his lack of these important qualities.

Hard Training is Golden Experience.—Some of our most successful engineers, the men who pull our most important trains daily on time attribute their good fortune in avoiding delays, to training they received in youth while running or firing worn out engines that could only be kept going by constant attention and labor. In such cases men must resort to innumerable makeshifts to get over the road; they have frequently to dissect the machinery to remedy defects, they learn in the impressive school of experience how a broken-down engine can best be taken home and how breaking down can best be prevented. Firemen and young engineers generally feel aggrieved at being assigned to run on worn out engines—the scrap heaps as they are called—but the man who has not passd through this ordeal has missed a Golconda of experience; his potentialities are petrified without reaching action.

Among a certain class of seafaring men the captain who fails from any cause to bring his vessel safely into port is regarded as disgraced. And therefore a true sailor will use superhuman efforts to prevent his ship from becoming derelict, often preferring to follow it to the bottom rather than abandon his trust. In many instances the sentiments and traditions of seamen teach railroad men valuable lessons. The sacrifice of life is not desired or expected of engineers in their care of the vessel they command, but every engineer worthy of the name will spare no personal exertion, will shrink from no hardship that will be necessary to prevent his charge from becoming derelict. Once I heard a hoary engineer, who had become gray on the foot board, make the proud boast, "my engine never was towed in." His calm words conveyed an eloquent sermon on care and perseverance. He had been in many hard straits, he had been in collisions, he had been ditched with engines, but had always managed to get them home without assistance.

Importance of Locomotives Steaming Freely.—As the purpose of a locomotive engine attached to a train is to take that train along on time, and as engines are generally rated to pull cars according to their size, it is of the utmost importance that they should make steam freely enough to keep up an even pressure on the boiler while the cylinders are drawing the supply necessary to maintain speed. A locomotive that does not generate steam as fast as the cylinders use it, is like a lame horse on the road, a torture to itself and to every one connected with it.

Essentials of Good Steaming Engines.—To steam freely, an engine must be built according to sound mechanical principles. The locomotives constructed by our best manufacturers, the engines which keep the trains on our first-class roads moving like clock work, are designed according to proportions which experience has demonstrated to be productive of the most satisfactory results for power and speed combined with economy. There are certain characteristics common to all good makers. The valve motion is planned to apply steam to the pistons at nearly boiler pressure, with the means of cutting off early in the stroke, and retaining the steam long enough in the cylinders to obtain tangible benefits from its expansive principle. Liberal heating surface is provided in the boiler, its extent being regulated by the size of the cylinders to be supplied with steam. With a good valve motion and plenty of heating surface served with the products of good coal, an engine must steam freely if she is not prevented from doing so by mal-construction or adjustment of minor parts, or by the wasting of heat in the boiler or in the cylinders.

An engine of that kind will steam if it is managed with any degree of skill. But as the best lathe ever constructed will turn out poor work under the hands of a blundering machinist, so the best of locomotives will make a bad record when run without care. Regular feeding, the water supplied at a rate to equal the quantity evaporated, which will maintain a nearly level gauge, is an essential point in successful running. It is hardly second in importance to skillful firing.

Causes Detrimental to Making Steam.—When an engine is steaming badly, almost the first action of an experienced engineer is to examine the petticoat pipe. The influence which this pipe exercises on the steaming qualities of an engine has already been adverted to, but its importance cannot be too strongly urged upon the attention of the young engineer. It is the most successful device invented for regulating the vacuum in the smoke box so that the currents of hot gases shall flow evenly through all the flues. Anything which interferes to disturb the flow of these currents, crowding them away from any section of the flue surface will have a prejudicial effect upon the steam. The pipe may be set too high to produce an even draft or the fault may be in the opposite direction. Its diameter may not be suitable for the conditions of smoke box and stack, or its shape may be at fault. Not unfrequently the pipe is fastened obliquely so that the blast impinges on the side of the stack producing evil results, or the braces which keep it in position occasionally break and the draft is permitted to shoot in every direction but the direct way to the atmosphere, and the effect is immediately apparent on the steam gauge.

The Smoke Stack.—The ordinary purpose of the smoke stack is to convey the smoke and exhausted gases to the atmosphere. If it is intended to perform its functions in a straightforward manner, it is made about the same diameter as the cylinders and its highest altitude rises from fourteen to fifteen feet above the rail. The stack is a simple enough article to look at, yet a vast amount of inventive genius has been expended upon attempts to expand its natural functions. Attempts have been made to utilize it as an apparatus for consuming smoke, and hundreds of patents hang upon it as a spark arrester. Patentees in pushing their hobby seem occasionally to forget that a locomotive requires some draft as a means of generating steam, and stacks are frequently so hampered with patent spark arresters that the means of making steam are seriously curtailed. Were it not for the danger of raising fires by spark throwing, it would be more economical to use engines with clear smoke stacks. Every obstruction to free draft entails the use of strong artificial means to overcome it. The usual resort is contracted nozzles, which induce a sharp blast and use up more fuel than would be required with an open passage to the atmosphere. Among the obstacles to free steaming that come under the category of obstructed draft, may be placed a wide cone, fastened low, and netting with fine meshes. When the draft passage is interrupted to a pernicious extent by spark arresting appliances, their effects can be perceived on the fire when steam is shut off, for the flame and smoke prefer the fire-box door to the stack as a means of exit. Sometimes steam making is hindered by the netting getting gummed up with spent lubricants and dirt from the cylinders. Cases occur where this gum has to be burned off before free draft can be obtained. Waste soaked with coal oil will generally burn off the objectionable coating. Gumming of the netting is usually caused by carelessness in oiling the valves. Some runners will shut off for a minute while the fireman oils the valves, and the lubricant scarcely gets time to reach the steam chest when the throttle is opened wide again, and instead of soaking over valves and cylinders and into the remotest part of piston packing, the oil goes through the stack with the first puff of steam. It is best in oiling the valves to leave the cup plugs open long enough for the oil to be sucked out of the pipes. Then, when steam is applied, it should be done by slightly opening the throttle so that it will work the oil into the piston packing, and after a few turns run this way there will be no loose oil left to defile the netting.

Certain kinds of coal deposit a hard, silicious substance upon the back flue sheet which gradually accumulates till the draft is seriously impeded. This, of course, prevents the full benefit of the hot gases being obtained and consequently the steam goes down. Flues stopped up with cinders produce a similar effect. The flues getting choked up with cinders is not always an indication that the petticoat pipe is performing its duty improperly. Stopping up of flues is often caused by wild, unskillful firing. A shovelful of coal pitched high deposits part of its load direct in the flues, and some pieces which are a close fit do not go through. They stick half way and small cinders soon follow, that quickly close up the entire passage.

Steam Pipes Leaking.—Steam pipe joints blowing in the smoke box is very disastrous to the steaming qualities of a locomotive. This has a double action against keeping up steam. All that escapes by leaking is so much wasted, and its presence in the smoke box interrupts the draft.

Grates.—Grates that are fitted so close as to curtail the free admission of air below the fire prevent an engine from steaming freely. The effect of this will be most apparent when the fire begins to get dirty. This is not a common fault. I have known of an engine's steaming being very seriously impaired by two or three fingers in one section of grate being broken off. The engine steamed well with a light fire till, in dumping the fire at the end of a journey, the men knocked some of the fingers off. Next trip she seemed a different engine. Nothing but heavy firing would keep up an approach to working pressure. I experimented with the petticoat pipe without satisfaction, assured myself that no leaks existed among the pipes; the stack, with its connections, was faultless, and the engineer was puzzled. The defect was discovered by watching the effect of the blast upon the fire. Signs of air drawing were often to be seen at the point where the broken fingers were. This was where the mischief lay. Too much cold air

came through unless the opening was bedded over by a heavy fire.

A drop grate that did not close properly nad a similar effect upon another engine which came under the author's notice, and a change which shut the opening effected a perfect remedy.

Scale and Mud.—In calcareous regions, where the water supply is drawn from wells, the most common cause for bad steaming engines is leaky heating surfaces, or water surfaces incrusted with lime deposits. When he sees water pouring from flues and stay bolts, an engineer has no difficulty in divining the reason why his engine steams poorly, nor need he be far-seeing to perceive a remedy in the boiler makers' caulking tools skillfully applied. The case of incrustation is, however, more difficult to comprehend in all its bearings. When water containing lime salts touches the hot flues or fire box, evaporation takes place, and the solid substance previously in solution is left behind and adheres to the heating surfaces, gradually forming a refractory scale, which is an indifferent conductor of heat. As this scale becomes thick, it stands up like a non-conducting barrier between the water and the hot sheets, and it takes a much greater expenditure of heat to evaporate the water inside. Just as a kettle coated with scale is much harder to boil than a clean one. When a boiler gets badly fouled with scale and mud, these impurities exercise a most pernicious effect upon the steaming qualities of a locomotive. Mud drums with blow-off cocks attached serve to check the growth of this evil when the engineer is careful to make frequent use of these appliances, and a strong pressure of washing-out water poured frequently through the boiler has an excellent cleansing effect; but some kinds of scale defy mud drums and the best methods of washing out, leaving the only resort to be the removal of flues for cleansing. The filling up of a boiler with scale and mud, so as to prevent the engine from steaming freely, is necessarily a gradual process, and an observant engineer has time to note the change and recommend the proper remedy.

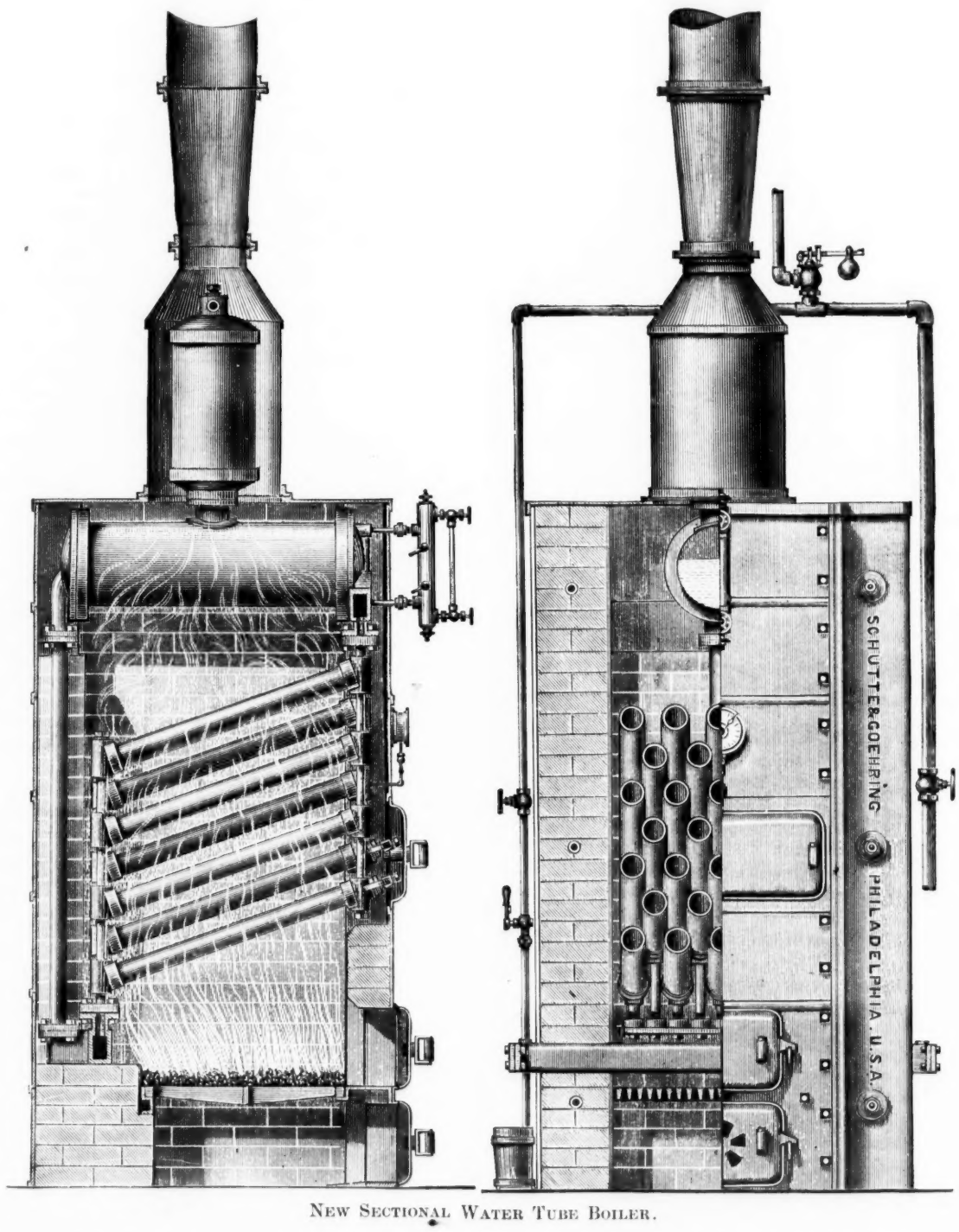
An old style anthracite locomotive in 26 days consumed 110 tons steamboat coal, costing about $282. The huge dirt burning engines of the Reading railroad company, in the same time, now consume 113 tons of buckwheat coal, which costs a fraction over $61, a saving in the matter of fuel of $221, more than enough to pay for engineer, fireman and oil.—*Railway Age.*

It is expected that the carpet factories of Philadelphia will produce 40,000,000 yards of carpet during the present year. The largest mill owners in the city are John and James Dobson, who run 400 looms, and John Bromley & Sons, who employ 380 looms. The facilities for production are to be largely increased, and the value of the product this year is expected to reach $25,000,000.—*Dry Goods Bulletin.*

The *Wiener Zeitung* of a recent date, gives an account of a trial which was made upon the railway between Leipzig and Riesa in order to ascertain the greatest speed possible to be attained The distance is short, the time occupied being 42 minutes, and the speed varied from 60 to 70 miles per hour.

Sectional Safety Water Tube Steam Boiler.

The fundamental principle in the construction of the sectional safety water tube boiler herewith illustrated, is to realize in practice the idea of a water tube boiler which would overcome the existing objection to this class of steam generators. The meritorious features claimed for this boiler are, the disposition of the tubes and steam drum in such a manner as to be subjected to uniform and equally distributed heat, allowing independent and free expansion to every part of the boiler without putting a strain on any of the joints, thus doing away with an objection that seriously prevents the usefulness of some forms of sectional boilers.



NEW SECTIONAL WATER TUBE BOILER.

By a series of tests the area of the circulating passages have been brought to the proper size to insure rapid circulation, thereby preventing a deposit of scale in any of the heated parts, while deposits of impurities in the water will be discharged from the mud drum at the occasional blowing off of the boiler.

The mud drum is fitted with removable covers to allow the passage of a scraper to facilitate the removal of mud.

The cubical capacity of this boiler, per horse power, is equal to that of the best practice in tubular boilers of the ordinary construction. The fire surface being of the most effective character, these boilers will, with good fuel and a reasonably economical engine, exceed the nominal power.

The space occupied by this boiler and setting is said to be less than that of the same capacity in many other sectional boilers. It is composed principally of lap-welded wrought iron tubes, arranged in sections, and inclined at an angle of about 15°, as shown in sectional elevation. These sections are connected with each other, and with a horizontal mud drum at the bottom, and also by vertical passages at each end with the horizontal water drum placed on top and connected with a vertical steam drum, located in lower end of smoke stack. The water fills all the tubes and extends up into the water drum.

The ends of the tubes are fitted with removable covers. The tubes are not placed above each other in a vertical line, but are staggered, so as to receive heat either by radiation or by direct impact of the flow of heated gasses upward through the spaces between them. The water inside the tubes when heated has a tendency to rise toward the higher end, and flows upward and into the horizontal water and steam drum, the steam being here given off, if the water is of sufficiently high temperature.

The back connections secures a downward current, and a continuous circulation is established, thus preventing the evils arising from the destructive strains consequent upon unequal temperatures.

The provision for cleaning the boiler, both internally and externally, is quite complete. Removable covers on ends of the tubes and mud drum, and removable iron plates both in front and rear of boiler, permit access to all parts of the interior.

The proportions of this boiler were adapted, after numerous experiments, with boilers of varying capacity; and it is said that it can be driven to the utmost, and still be free from objections frequently attaching to boilers of both small and large capacity—carrying a steady water level and steam pressure, and furnishing dry steam.

Besides being available for other uses, this boiler can be adapted to steam vessels where small space and a quick generation of steam is desired. It can be also arranged for sectional transportation, each package being limited in weight so that any size boiler can be transported over mountain passes or over roads in bad condition, where railroad facilities do not exist—as in foreign countries, and in places to which the transportation of heavy pieces of bulky machinery is not practicable.

In arranging for sectional transportation, it has not been done at the expense of other desirable qualities.

Each boiler is submitted to a pressure of 550 pounds per square inch before leaving the factory, at which pressure all parts are required to be absolutely tight.

It is claimed that this boiler has already gained a high reputation in respect to economy and practical immunity against the danger of destructive explosions. They are manufactured in all sizes, from ten-horse power upward, by Schutte & Goehring, Twelfth and Thompson streets, Philadelphia; or sold by A. Aller, 109 Liberty street, N. Y., who has the agency for the States of New York, New Jersey, and Connecticut, and at whose rooms one of these boilers can be seen in operation.

LETTERS FROM PRACTICAL MEN.

Making Chasers with Odd Threads—Grooving Taps—Tempering Taps, Reamers, Etc.

Editor American Machinist:

A few years ago I broke a screw on one of my instruments. This necessitated sending the instrument, or part of it, back to the States to get a new one fitted—which would involve the loss of at least six or eight weeks' time and express charges of from $20 to $25—or the devising of some way of making one here.

I had hunted in all of the jewelry, gun and blacksmith shops for a screw plate with the right number of threads, but, of course, I failed to find one. There was no screw-cutting lathe in the vicinity on which I could cut a screw, or make a hob with which to cut a chaser. Under these circumstances, it became necessary to originate a screw; and for the benefit of others, who may some time be similarly situated, I will tell how I managed.

I found a jeweler who offered me the use of a small hand lathe with a slide rest, the feed screw of which was, I believe, 14 threads to 1″. The screw I desired to cut was an odd number—47, I think. The problem I had to solve was how to produce a screw of 47 pitch from one of 14 pitch, without gears, and this is how I did it:

I first turned and filed up a milling cutter about ⅛″ diameter, the edge of which I made of the same shape as the thread on the broken screw. I then took a strip of thin brass, drew a straight line through the center, took a pair of sharp-pointed dividers, setting the points about ⅛″ apart, and marked off 47 points along the line on the brass strip, prick-punching small holes at each point. I cut off each end of the strip a little over ⅛″ beyond the end holes, bent the strip in the form of a hoop, and fitted the ends squarely together until the two end holes were brought the same distance apart as the others. I then wired the ends together, and soldered them with silver solder. I next fitted a wooden wheel on a flange in place of the feed handle

of the slide rest, placed this wheel in the lathe, and turned it down until the hoop fitted snugly. I now had an index divided by 47 true enough for the purpose. I then forged a blank chaser, fastened it in the tool post of the slide rest, placed my cutter in the lathe, and commenced by milling a groove in the end of the blank chaser to the depth of one thread, screwing the cross feed up to the cutter, and marking the position of the handle. I then backed up the cross feed, and advanced the feed screw 14 holes on the index, and milled another groove by screwing up the cross feed to the same point as in the first cut, bringing the handle to the position marked when milling the first groove, and so on till I grooved the end of the blank across its whole face. I then filed up the chaser, so as to give the proper rake or slant to the teeth, hardened it and did the job, making the required screws with my improvised chaser, a perfect fit.

Any required chaser can be easily made in this manner, the rule being to make an index having same number of holes as the required screw has threads to one inch, and advance it the same number of holes as the lead screw has threads to one inch; or, when both numbers are divisible by same number, make a fraction, the numerator being the number of threads in the lead screw, and the denominator the number of threads in the required screw; then reduce to its smallest denominator. For instance, the lead screw has 12 threads, and it is required to cut 48; then, as $\frac{12}{48} = \frac{1}{4}$, you can make an index of four holes, and advance the screw one hole on the index.

I believe the way to groove taps is to make spiral flutes like a twist drill, only giving less twist, making the flutes with circular section.

Small taps up to say $\frac{1}{2}''$ diameter, I file up in the vise, with 3 flutes. I use for this purpose a drill file, or a round file. By this method of fluting you can give full stroke to the file, and finish quicker than you can rig up to plane or mill them with the ordinary straight flutes. Any one using this form of tap for the first time will be surprised at the ease with which it cuts, if otherwise properly made.

I have found by experience that there are only a few machinists who can harden and temper such tools as taps, fluted reamers, &c., and do it properly. They sometimes burn the steel, spring the tool, or crack it in hardening, or temper it so unevenly that it will come out with all the colors of Jacob's coat. I will tell how I do it, and if any one thinks it better than their method they are welcome. There is no patent on it, neither do I claim it as original. I expect a great many mechanics will say, "Who don't know all that," &c. Some may have even a better method

If I have many tools to temper at one time, I use a lead bath. I heat the tools only sufficient to harden, and if heated in an open fire, I use hard soap to prevent oxidation. With some steels which require a high heat to harden, I have found the use of a paste made of prussiate of potash and salt, dissolved in stale beer and thickened with flour, of advantage.

The tool should be heated perfectly even, not too quickly, and still it should not soak in heat too long Experience must be the only guide on this point. After it is properly heated I quench it in a bath of salt brine containing prussiate of potash and corrosive sublimate, acidulated with sulphuric acid. This solution should have the chill taken off so that the temperature is about 50° to 60° F. I don't say that I know this solution is better then pure water, but I have always had better *luck* (if that is the right word) with it than with pure water.

I dip the tool perfectly straight, without motion side ways, and after dipping quickly to a point above where I desire to harden it, then dip very slowly, and raise and lower it slowly for a distance of an inch or two. After the shank has cooled down below a red heat, I cool off by dipping its whole length. After this I polish so as to give a bright clean surface, then wipe it all over with an oily rag or waste, to give a very thin film of oil all over the surface (lard or sperm oil—not mineral). I then heat to a red heat an iron ring or tube of sufficient weight to retain heat, and of sufficient length to take in about $\frac{1}{4}$ or $\frac{3}{8}$ of the length of the hardened portion of the tool. The hole should be of a size so that the tool when placed in the center will be an inch or so from the hot ring or tube. Insert the tool in the hole, moving it slowly back and forth and turning it around until it takes on the desired color.

For a $\frac{1}{2}''$ tap or reamer, a piece of 2" or $2\frac{1}{2}''$ gas pipe, about 3" long, answers a good purpose. Other tempering sleeves can be made of old pulley hubs, or other pieces that can be found in the scrap heap. Draw the temper slowly, and let the tool cool off without quenching in water, and I believe you will have a satisfactory job.

These tempering sleeves are excellent for drawing the temper on many other tools when an even temper is desired.

GEO. B. FOOTE.

Helena, Montana.

A Handy Bevel.

Editor American Machinist:

I have just made a bevel of which I send you sketches shown in the accompanying engravings, in which Fig. 1 represents the bevel with the blade closed upon the projecting ledge. Fig. 2 shows the blade closed when not in use, while Fig. 3 shows the blade opened

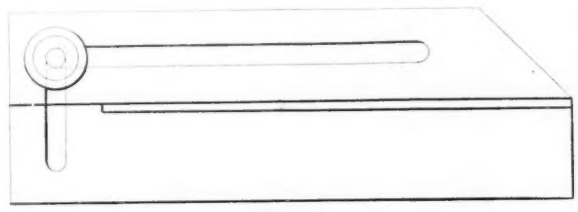


Fig. 1

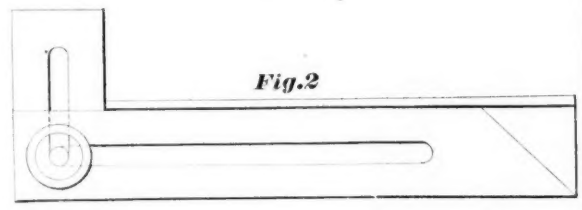


Fig. 2

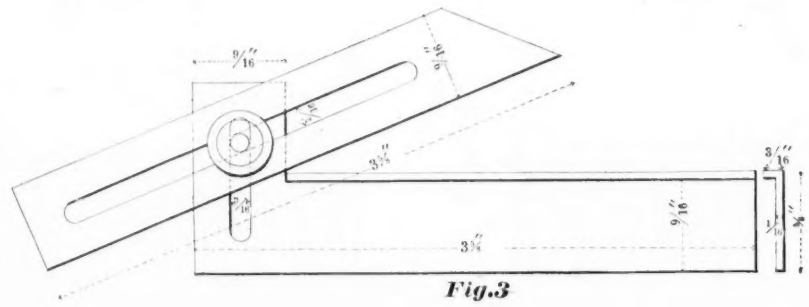


Fig. 3

in position for application to any work desired. It may be found very useful by many of your readers. It differs from the old time bevel which has two sides. This has but one side, with blade and thumb screw. The blade can be set to any angle in making gauges, templates, &c., of very thin material. The work can be applied directly under the blade which cannot be done on the old bevel, it having a slot in line with the blade. When not in use as a bevel it can be used as a try square. It is made of steel, $\frac{5}{16}$ inch thick, planed on the side to form a recess a little more than the thickness of the blade.

R. MCLAUGHLIN.

Effect of Long Steam Connections Upon Indicator Diagrams.

Editor American Machinist:

I inclose you two diagrams from a direct-acting vacuum pump used in connection with a steam-engine condenser. The cards were taken under the same conditions, except that the indicator pipe was shortened after taking diagram *A*, from about $2\frac{1}{2}$ feet in length to 6", and one elbow was taken out. Card *B* was then taken, which more nearly represents the true form. The scale is 20.

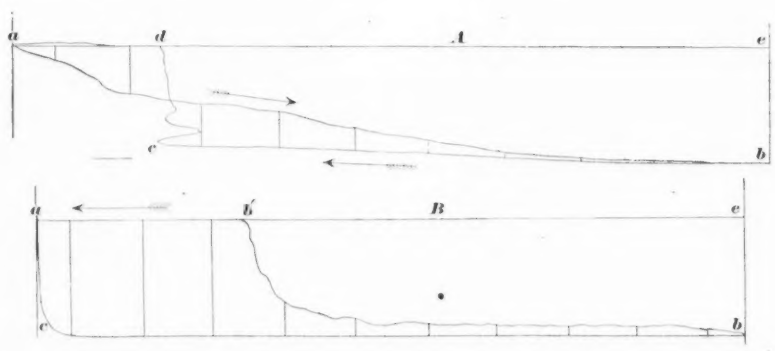
These cards show clearly the evils of long indicator connections on air pumps. They will impress your readers no doubt with their peculiarity, and will need to be explained. The arrows show the direction the piston is moving.

The line *a*, *b*, card *A*, represents the pressure following, and the line *b*, *c*, *d*, *a*, the pressure opposing the piston.

In card *B*, the line *a b'*, *b*, represents the following; *b*, *c*, *a*, the opposing forces; and *a e*, *a e*, in both diagrams are the atmospheric lines. In *B*, *c a*, is the expansion; *b b'* the compression curve, *b'a* is the discharge line, and *b c* the line of greatest vacuum. Curves on these diagrams represent clearances not filled with water.

Water cannot form a curve by compression or expansion, while air always does. The curves on accurately-taken air-pump cards represent the amount of the air contained in the pump, and a comparison of the compression and expansion curves will give the amount of air discharged each stroke. Air leaks can, in this way, be detected without question.

It appears from card *A* that the discharge valves leaked back badly, or that there was a great deal of air remaining in the clearances at the completion of each discharge,



and which partially destroys the vacuum behind the piston upon the return stroke. If the latter were true, however, we should find a very gradual compression curve. But there is no compression curve at all. There is an abrupt rise at *c* which indicates nothing but solid water.

My conclusion at the time was that there was a bad leaking back somewhere. This was a very natural conclusion, but far from the truth. It would have been true without much question if the diagram had been true. The theory, however, was based on a falsehood, and the conclusion was an error. The writer is not the first one who has been duped by an indicator diagram.

Many have based the most elaborate discussions, and have arrived at the most surprising facts from indicator inscriptions which did not represent the pressures as they existed.

In this case the discharge valves were examined and found to be tight. Then the indicator pipes were changed, and the locality of the evil discovered. It was not wholly remedied, however, for card *B*, though infinitely better than *A*, is only an approximation to the truth. It would have been better to have screwed the indicator cock directly into the pump if it could have been done, and even then the card would not have been absolutely correct.

STEAMCHEST.

Hartford, Conn.

Good Tool Steel vs. Mushet Steel.

Editor American Machinist:

To the inquiry in relation to Mushet Steel *vs.* Cast Steel contained in communication from W. Dicks, in your issue of Feb. 4th, I have to say that my use of Mushet steel has been so limited that the peculiarity of color of sparks evolved by grinding had escaped my notice. I have no doubt the author of "Why Does Steel Harden?" could give a very interesting solution of the problem. But as I would be obliged to say "Don't know," will you listen to a few questions of an inferential nature which may throw some light on the subject?

Is it not evident that a steel containing so large a proportion of carbon as to not only require no hardening, but in its natural condition being so hard as to resist all efforts to work or cut it in any ordinary manner cold, and not susceptible of annealing even, would, under the laws which govern combustion (owing to the great excess of carbon contained proportionately with the other steel), show a spark of different color and appearance from that emanating from steel containing so little carbon as to require hardening to cut wood even, and susceptible of annealing to a degree of softness permitting it to be bent, twisted, or cut into any shape required?

Perhaps Mr. Dicks is sufficiently familiar with Mushet steel to explain how it can be possible for it to stand, in the shape of lathe or planer tools, to do on certain work, such as car wheels and rough castings, more than five times the amount of work which can be done with the best cast steel tools hardened, as claimed by some of its advocates.

An experiment made by the writer showed that it was a very easy matter to make a drill of cast steel (of a temper susceptible of annealing and working cold) which would drill through pieces of Mushet steel $\frac{1}{2}''$ thick without oil or other lubricant. After drilling one such hole of $\frac{5}{8}''$ diameter, the drill was found to be in good condition to drill a second hole without grinding. After making a planer tool of Mushet steel and using it until it became dull in surfacing a lot of dies of best high tempered tool steel, I next put in use on precisely the same work a tool of as nearly as possible the same size and shape made from a good quality of tool steel, and found that with no greater injury to itself it had accomplished 66 per cent. more work than was done with the Mushet steel. If it is a fact (and from the testimony of many we are almost led to conclude that it is) that in cutting castings or other material the structure of which is composed in part of sand, aside from being hard, the Mushet steel will so far excel other good steel, there must be, as for everything else, a reason. As at the time of making the experiments noted above, my work was wholly upon steel, I had not the means to pursue my investigation as far as I would have liked. But to my mind, the fact seemed to be established that good tool steel could be hardened so as to exceed in hardness and cutting qualities the Mushet steel; and if it were true that for certain work it was less durable, I was driven to the conclusion that there might be cases where the excessive friction of cutting through sand would draw the temper in ordinary tool steel when the Mushet steel would not be affected. I am of the opinion, however, that there are but few cases in which good tool steel can not be hardened to cut to advantage anything requiring to be cut, from hard steel to chilled iron, and the many cases in which merely forging and grinding fail to give the shape

required in tools and cutters will be likely to, "in the future as in the past," leave the average mechanic somewhat in the dark in regard to the peculiarities of the steel which "needs no hardening" and "can't be touched with a file."

S. W. GOODYEAR.

Waterbury, Conn.

A Boring Bar.

Editor American Machinist:

Among the most attractive features of your paper to an attentive reader are the "kinks" that appear with nearly every issue. In my own case I find that an idea received through the medium of an occasional contributor, who not only gives the reader the benefit of his ideas, but withal does the work, seems to fasten itself to one's memory more firmly than if obtained from a voluminous text work. I have no excuse to give to an over critical reader for the idea brought forth in this letter.

A few may have known of it but many more have not. Having several very large disc cranks to fit up we found it necessary to improvise a boring device for the crank-pin holes. At the master mechanic's suggestion I built the tool shown by the accompanying sketch.

The bar *A* being about 7 feet long, was moved by a worm and worm wheel, and carried by a pair of sleeves revolving in their respective bearings. Where a horizontal boring machine of the kind above mentioned would not be accessible, one end of the bar clamped to a lathe face plate with the other carried by a well appointed "steady rest" would give equally as good a result.

As shown by the dotted lines the flat sides of the bar are not planed parallel with the center in order to insure the requisite taper. The sliding head *B* contains a square hole *G*, for the reception of a tool which is held by a flat-sided pin in the hole *H*, drilled diagonally through. At the bottom of the tool slot *G*, a small hole is drilled in order to remove a "cranky" tool. The screw *C* is ininserted through the end of the bar and held in place by the cover *D*. For finishing the handle or crank on the square end of the screw, it may be blocked allowing for the eccentric movement of the screw.

T. M. YOST,
Middletown, Pa.

Tools for Lining Up Engine Guides.

Editor American Machinist:

I send you herewith sketches of a tool for lining up the guides of steam engines, which I find works to perfection, and is far more correct for setting the guides in line with the cylinder than by using inside calipers, besides doing the work much more quickly.

In Fig. 1 of the accompanying engravings *A A* represent the guides, with two angle plates *C C* resting on their sides, and connected together by bar *B*, pivoted at *M M*. *E* represents a hole to receive a pointer *L* (in Fig. 2), which is always central with the angle bars *C C*, the same being kept in a parallel line. This tool was made with a single connecting bar *B*, for lining up guides, which were cast together in one piece. But by simply connecting two bars (shown by the dotted lines *F F*) to the angle bars *C C*, parallel to bar *B*, it can be used for lining up guides that are separated.

It will be obvious to any machinist that, by closing the angle bars towards the center line, it brings their faces closer together; consequently, guides of different widths may be set with this tool, and will be found to be accurate.

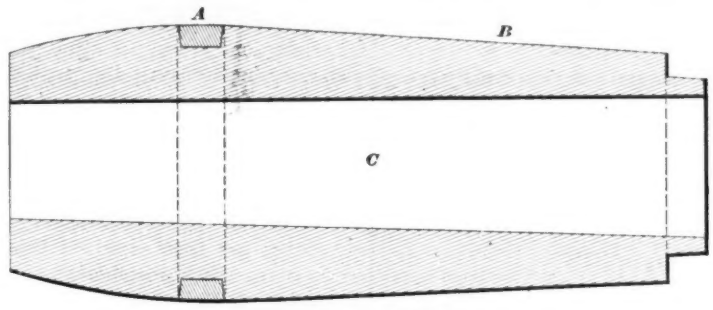
In using this tool for setting guides, such as are used on locomotives, it is only necessary, after getting the center line *I* drawn through the cylinder, to place the tool between the guide bars, and set them in position by the pointer *L*, under center line, it being understood that Fig. 2 shows the tool resting upon and between the two bottom guides, as upon a locomotive.

Clamp the guide fast, and move the tool from one end to the other. Care should be taken to keep the angle plates *C C* close upon the guide bars. By using the two additional bars *F F* for separate guides, the faces of the angle plates will open and close, with their inside bearings always parallel.

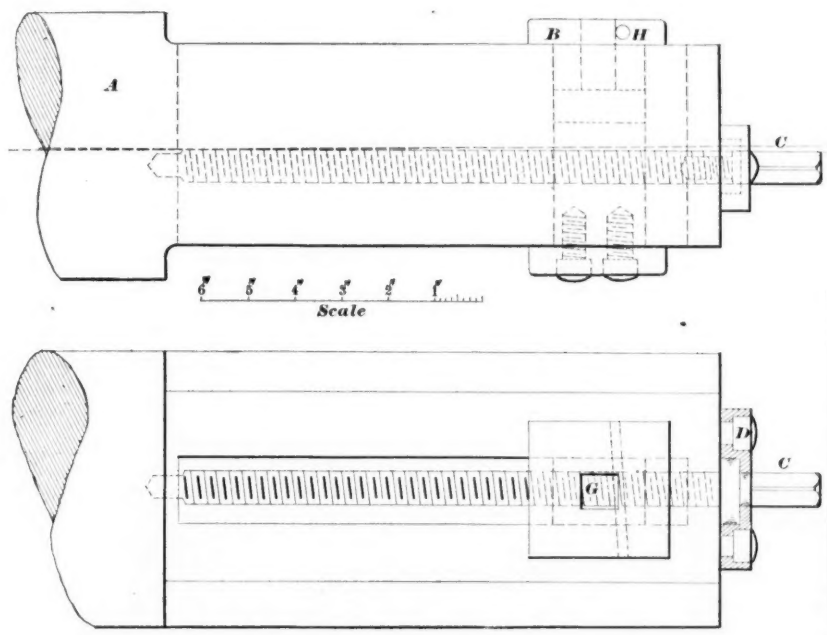
The bar *B* is connected to angle plates *C C* by the screws *K K*. The bar *B* should have a boss G, as shown underneath, to give the pointer a long bearing. This pointer is held in position by the screw *S*. In making this tool, great care should be observed to get the screws *K K* and pointer *L* exactly in line with each other.

This tool does not cost much to make, and every shop where engines are built should possess one. I have not patented it, but give it for the benefit of the craft.

Newark, N. J. A. PHELPS.



A WRENCH HANDLE KINK.



BORING BAR.

Paper Mill Work.

Editor American Machinist:

The new "wrinkles," "kinks" and "hints" I have derived from the AMERICAN MACHINIST are invaluable.

I have often wished it would give a few hints in regard to paper mill work, and know of no better way to set the stone rolling, than to give it the initial push.

Take, for instance, the setting of a new bed plate for a rag engine. We put plate in position as near as possible by guess, then lower the roll upon bed with a piece of thick wrapping paper interposed. Upon raising roll again, if knife indentations are not uniform in depth, wedge up bed plate until roll bears correctly. If I could learn of a more expeditious and less tedious way, I would be glad to test it.

A few weeks ago a chap came along and said he wanted his boiler tested and engine overhauled. She slobbers unmercifully. Can you do it? We told him we could try it. Selecting a few tools, and taking a small hand force pump (used for washing carriages), also an accurate steam gauge, I departed with the knight of the saw mill.

On arriving at the mill the boss at once took off his coat, rolled his overalls to the top of his rubber boots, and said he would help. I gave him a scraper, and told him to scrape away the grease until he found the engine. The mill contained the usual plant of a country saw mill, driven by a 3-foot water wheel, with an engine, as was said, to "run it in low water."

While looking the thing over we asked, "Who runs your boiler and engine?" We got the usual answer: "O, I run it mostly now; Tim, the boy there, used to, but he pumped the boiler over two or three times, and once he let the water all get out, and melted out the plug." I asked no more questions, but went for the engine; pulled off cylinder head, calipered cylinder, set out packing rings a little, opened steam chest, and what a valve, and what a seat! Well, we put valve (plain slide) in a vise and surfaced it; then surfaced the seat; put things together, and made necessary adjustments.

I took off steam gauge, filled it and ours with water, screwed one to either end of a short piece of rubber hose, also full of water, which we had previously fitted with requisite couplings. We screwed these into vise, and found gauge correct. "Say, Mister, what are you going to do with that pump?" said boss, jerking his thumb toward my carriage pump. "Test your boiler." "Test my boiler! I guess you'll test your pump," said boss, turning up his nose. I ran an old eave spout from flume, and filled boiler through safety valve. With steel tape and center punch measured and marked lever in a num- of places, and chalked on the figures. Attached pump, and pumped inwater until air was all expelled.

"How much steam do you carry?" "Oh, anywhere from 30 to 80 lbs.," said boss.

"Well, the safety valve is set at 140 lbs, you may pump her up." "Humph," said boss, putting pump into a pail of water, and giving a stroke; up went the gauge hand to 15 lbs. Boss twisted his head over his shoulder, and glanced at the gauge with open mouth.

Another stroke, 30 lbs. Boss faced around, eyes protruding; another stroke, 40 lbs. A big stroke, 50 lbs. We gradually worked up to 120 lbs.; measured again, nothing started. At 140 lbs. boiler had stretched $\frac{1}{16}$ in. in girth, and started one or two slight leaks. I let off pressure and water, got up steam, told him he might carry 60 lbs. Started engine; she didn't slobber any more.

I retired, leaving boss intent on a little problem in hydrostatic pressure.

E. Pepperell, Mass. JAMES F. HOBART.

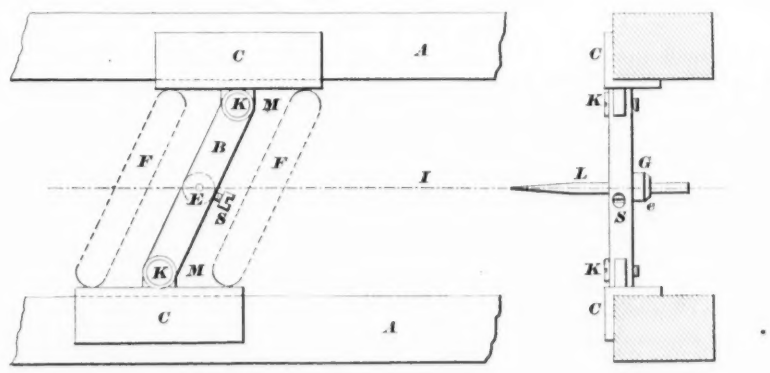
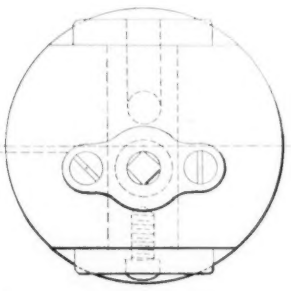


Fig. 1. *Fig. 2.*

TOOL FOR LINING UP ENGINE GUIDES.



A Wrench Handle Kink.

The cut at the top of this page represents a very ingenious method of strengthening the handle of the Coes screw wrench.

The wooden handle *B* is bored at *C* to fit the shank of the wrench, as usual, and a groove is cut to receive the collar *A*. This collar is made of the best Norway iron of a sufficient diameter to just slip over the wooden handle. Each side of the collar is beveled, as shown, and a cut run over the top in a lathe. Then, by placing the collar in the groove and applying a uniform pressure all around, the collar is closed or upset to fit tightly round the handle. The apparatus for closing the collars consists of two steel dies, cut in the form of the wrench handle. These are placed in a press (controlled by the foot of the operator), when, by a succession of blows or squeezes, beginning at the larger part of the dies, turning partly around at each stroke, and finishing near the smaller end, the ring is pressed into the groove, until its outside surface is flush with the surface of the handle.

This device was gotten up by L. Coes & Co., Worcester, Mass., in whose works we noticed its application. It is, we believe, to be applied to such of their wrenches as are to withstand extraordinary strains, the wrench as now constructed being strong enough for any ordinary work.

B. B. Hotchkiss, the American inventor of the revolving cannon adopted by the principal governments, and which was illustrated and described in the AMERICAN MACHINIST of December 13, 1879, has received the decoration of Chevalier of the Legion of Honor on account of his services to the French marine. The Danish government has also conferred upon Mr. Hotchkiss the Cross of Denmark for similar services rendered to its artillery.

Telephonic communication 300 miles under the sea has proved successful in England. An American invention increased the power of the voice.

B. H. Warder offers to give $50,000 to establish a Mechanics' Institute in Springfield, O., if the citizens will pay for a suitable site.

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NEW YORK, MARCH 4, 1882.

CONTENTS.

PAGE.

New 14" Swing Engine Lathe 1
Comparisons Between High and Low Speed Engines. By Chas. A. Hague. 1
Different Methods of Arranging Tubes in Steam Boilers 2
Moulding Large Quarter-turn Pipes in Loam. By Thomas D. West 2
A Cheap Universal Joint 3
Improved Hydraulic Jack 3
Responsibility of Owners of Large Buildings 3
Fire Protection Against Electric Lighting 3
New Automatic Cylinder Cock 4
Locomotive Engine Running, Trouble on the Road. By Angus Sinclair 4
Sectional Safety Water Tube Steam Boiler 5
Letters From Practical Men—Making Chasers with Odd Threads—Grooving Taps—Tempering Taps, Reamers, Etc—A Handy Bevel—Effect of Long Steam Connections Upon Indicator Diagrams—Good Tool Steel v. Mushet Steel—A Boring Bar—Tools for Lining Up Engine Guides. 5, 6, 7
A Wrench Handle Kink 7
Value of Industrial Exhibition Awards 8
Fire Escapes 8
Effects of Prison Contract Labor 8
Questions and Answers 9
Manufactures 9
Machinists' and Engineers' Supplies 10
Iron and Metal Review 10

Value of Industrial Exhibition Awards.

Some customs and practices usually favorably regarded by the public become, in time, distasteful through being followed to excess. A few years ago it was generally regarded as a mark of special merit to receive a medal or diploma as an award for some article exhibited at an industrial exhibition. The inventors of patent machines, tools, saw-bucks or churns, fresh with the flush of victory, after being named for a shining medal accompanied by a prudential quantity of "taffy," in the form of a judges' report, would gaily seek the sanctum of some industrial newspaper (if they were not, themselves, sought first) and make terms for suitably notifying an admiring public of their triumph. Then it was that the publishers of commercial and technical journals were always supplied with electrotyped cuts of American Institute and other medals, in assorted sizes, thereby being enabled to accommodate the delighted medalists as promptly and touchingly as certain daily papers do the anxious mourners with obituary verse. It must be admitted that the medal system worked well before it lost its novelty. Customers for mechanical articles (especially those from remote parts) upon visiting a manufacturer would experience a moderate feeling of awe, as they gazed upon an array of framed diplomas adorning the office wall, handled the bright medals brought out of their velvet cases by the proud recipient of exhibition honors, and read the glowing reports of the judges. The system was warmly encouraged by the press as tending to stimulate improvements. But their reading and advertising pages smiled, as it were, upon dispensers of awards for superior merit. As soon after the fair as each of the six or eight sewing machine manufacturers could get their announcements of the "Very Highest Award," properly displayed (accompanied by such indubitable proofs as cuts of the medals and decisions of the judges) prudent housewives could read at a glance just where to buy the best machine to stitch the family raiment.

Contests as to veracity of exhibitors would be carried on through the newspapers. Charges, counter-charges and explanations would follow in rapid succession. Every set of awards gave rise to fresh complications and new declarations of war.

The unhappy journal that in an unguarded hour admitted one of these charges (in the form of a smoothly-worded communication to the editor) to its columns, soon found itself overcrowded with letters of like nature from other parties in interest, until in sheer desperation it was forced to abandon the publication of such letters altogether. But after repeating the same programme several successive years it grew monotonous and popular taste demanded a change. Some of the more progressive exhibitions instituted competitive tests of machinery, engines, boilers and appliances. This course was supposed to obviate the difficulties in the way of conferring suitable awards, but it has only aggravated them. Until the memory of the unseemly squabbles over the placing (or withholding) of the $500 award offered for the best engine tested at the Cincinnati Millers' Exposition has faded away, the mechanical public will regard the competitive award system with well founded distrust.

In view of past experience, very few manufacturers are desirous of giving prominence to the fact of obtaining a medal at some fair last fall. *Fac-similes* of medals do not grace the advertising columns of newspapers as they formerly did. At least one large and highly-successful exhibition society — the New England Manufacturers' and Mechanics' Institute—has started out and kept clear of the whole medal and award system. The custom of dispensing awards, however, has not died out, in spite of public apathy. At its exhibition, last fall, the American Institute gave out 313 bronze medals, 221 diplomas, and a lot of gold medals and other (supposed) tokens of merit. The Charitable Mechanic Society, in Boston, also distributed a considerable weight of bullion in medals. These pieces of metal and pasteboard may be useful to please children, but their impressive influence upon the average buyer of mechanical productions grows beautifully less with each recurring autumnal dispensation.

Fire Escapes.

Since the recent fire in New York, by which several lives were lost, a great deal of energy has been expended in devising means of escaping from burning buildings. According to various individual views the fire service should be converted into a brigade for carrying portable fire escapes; buildings should be provided with fire escapes of all forms and devices, and they should be carried around as the personal property of the individual. Inventors are setting up fire escapes and inviting the interested public to witness what a simple matter it is to escape when there is no fire, and in process of time—not a very long time—the business of the patent office will feel the effect of the present agitation, and—what then? Unless all previous experience goes for nothing, things will settle down quietly until a repetition of the recent disaster shall bring about recurring activity and succeeding quiet

There is nothing phenomenal in the present activity in this direction. It is simply a repetition of what has occurred in every instance of the kind during the past fifteen years, and will undoubtedly end in exactly the same way; that is, in adding to the record in the patent office by which the date of this fire, as of others in which human life was sacrificed that have preceded it, can be fixed with reasonable accuracy.

At best fire escapes afford an unnatural means of leaving a burning building. The inmates are not accustomed to their use, and it is usually demonstrated that they are out of order when wanted and, often but little less dangerous—especially to women and children—than the fire itself. This is of course without saying that they have not in some instances been of value, but that generally speaking they have not been a success. To such an extent is this true that it would seem time attention was turned in some other direction for safety, particularly so since, notwithstanding the progress of the past twenty-five years, it seems to be a fact that the prospect of the inmates getting off with their lives, in the event of a fire in the average city building, is less to-day that ever before.

It does not matter how nearly, or how entirely fire-proof the outside of a building may be, since fires by which lives are sacrificed, as a rule, originate in the interior.

The fact that in broad daylight the burning of a building from which all the occupants could have quietly walked in a few minutes, should result in the loss of several lives—how many may never be known—is evidence of something wrong with the interior construction.

Sometime the industry carried on in a building calls for the accumulation of considerable quantities of combustible material, but this was not the case to any extent in the instance noted; the trouble being that in this building, as in hundreds of others, the whole interior seems to have been constructed with special reference to rapid combustion.

It may be—probably is—difficult, if not practically impossible, to make the interior of a building fire proof, but it has been demonstrated, if it ever needed demonstration, that floors and partitions can be constructed so as to check the progress of a fire for a considerable time. It has even been proved, and is constantly being shown, that wood work can be rendered nearly incombustible, yet this knowledge seems to serve but little useful purpose so far as the security of human life is concerned. If more attention was paid, in ways that are well known, to rendering the spreading of a fire throughout the entire building, not impossible, but a question of a little time, and less to the devising of fire escapes that are never used, it is probable that, in the event of a fire, people would walk quietly out of the building in the ordinary way.

With reference to fire escapes, the passage by the way of the stairs in common use is the most natural one, and, if properly constructed, this part of the building should be the last to yield to a fire instead of the first, as is too often the case. The location of the stairs is known to all in the building, and in a panic every one turns to them instinctively as a means of egress. At least this part of a structure, together with the halls and approaches, could be made so nearly fire proof, and so little dependent on the other parts for stability, as to provide a fire escape always in place, and in condition to be approached and used, at least as long as any part of the building was tenable.

The rendering of the loss of life in the instance of a fire in our high city buildings improbable, is not so much the matter of new inventions as the putting in practice of common sense ideas well known. It resolves itself into a mere matter of dollars and cents, versus human life.

Effects of Prison Contract Labor.

Contractor A. F. Ball, who hired the Northampton, Mass., jail labor at $900 a year, has employed the past year a daily average of 18 men on halters and blanket straps, 50 dozen being turned out monthly, with shipments semi-monthly. The contractor is supposed to make a good profit, as it costs him about 10 cents a day per man on an average, the prisoners being worked about nine hours a day.—*Springfield Republican.*

Here is another individual who is doubtless satisfied with the convict labor system, as practiced in 37 out of 38 States of the Union, also in all of the ten Territories, and is convinced that those who actively oppose it are demagogues. From the great Sing-Sing prison to the small Northampton jail, this country contains hundreds of penal institutions—State prisons, penitentiaries, county jails, reformatories and work houses—where the inmates are required to perform some kind of hard labor. Instead of directing this labor in occupations that whould not conflict with free labor and that would produce some public benefit, the productive force of convicts is jobbed out to a small army of contractors at prices ranging from 10 cents a day to—in rare cases—70 or 75 cents a day, the great body of prisoners being employed at from 30 to 45 cents a day. Is it necessary for the purpose of convincing intelligent men, not either directly or indirectly interested in prison contracts, to dwell upon the fact that by this system a great injustice is done the honest toilers in free productive industries? Or is it necessary to inquire into the private resources of contractors for evidence to show that they are amassing wealth at the expense of the community by securing the steady labor of able-bodied men at prices that would not buy the plainest food to satisfy the hunger of free workmen?

It is not to be expected that individuals can often trace, directly, the effect upon themselves of prison contract labor. In considering this subject, the mistake is likely to be made of assuming that prison competition is injurious only to workmen engaged in occupations pursued in the prisons. So intimately do all the trades depend upon each other that whatever affects one must react, to some extent, upon the others. If the manufacturers of stoves and hollow ware, hats, saddlery hardware, boots and shoes, experience evil effects from the prison contract system, so will the manufacturers of iron, machinery and tools, though not in as great a degree. When business of all kinds is brisk, as it is now, prison competition will not receive the attention it warrants. Not until there is a lull in our industries like that following the panic of 1873 will its full force be experienced. The contractors realize this, and will leave no stone unturned to quietly secure extensions of contracts, so that when a business reaction occurs they will be masters of the situation. There is but one remedy, and that is this, to abolish the contract system root and branch.

A young man who writes that he is a "representive of the press, but not Machinial," and that he is "well posted in on Machinacle subjects," wants a position on the AMERICAN MACHINIST. As he is but twenty years of age, and there is no vacancy just now in our

editorial force, we have advised him to apply to some of our younger contemporaries.

The Western *Carriage, Wagon and Harness Journal* is one of the things that no one interested in the matters represented by their title can afford to be without. It deals logically with the subjects, and keeps its readers posted on matters of interest to them.

Our neighbor, the *Sanitary Engineer*, since its advent as a weekly has, if possible, continually increased in attractiveness. The *Engineer* is authority on matters relating to sanitary engineering, and always aims to give information relating to things within its province, in a clear and practical manner.

The New York Review of the Telegraph and Telephone is a bright new 16 page semi-monthly journal that claims attention as an independent representative of electrical literature. The first number is neatly printed, and contains several readable and instructive articles, besides considerable miscellany pertaining to its specialty. Published by George Worthington, 23 Park Row, New York, at $2 a year.

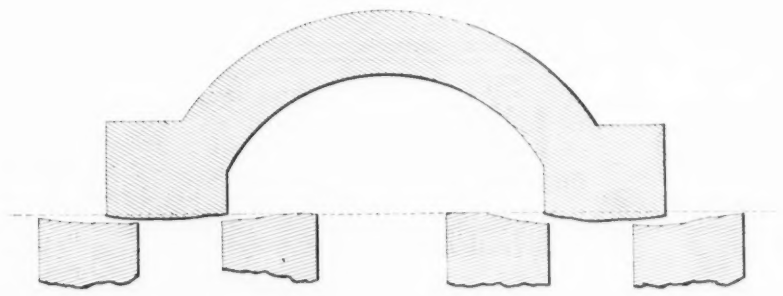
A story is told of a farmer who built a stone wall four feet high and six feet thick, so that when it should fall over it would be higher than before. We don't suppose that our neighbors, Munn & Co., publishers of the *Scientific American*, contemplated any sudden upsetting in their old offices in the "World" building, 37 Park row, but certain it is that being burned out completely and hastily about noon January 31st, before night they were installed in more desirable offices in a much better building at 261 Broadway, with new furniture and fixtures. Their books and papers were preserved, and the *Scientific American* and the *Scientific American Supplement* and their extensive patent business, go right along, as if nothing unusual had happened.

QUESTIONS & ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

J. H. D., and others, ask us to reproduce the three sketches of methods of placing tubes in boilers, referred to in answer to Question No. 27, January 21, 1882, in response to which we have published them on page 2 of present issue.

(67) M. F. R., Marshalltown, Iowa, asks: Are the arms of pulleys with even number of arms more liable to crack than when the number is odd? *A.* No.



(68) W. G., Fremont, Ohio, asks: In splitting a reamer, say for about 2″ from the end, so that it could be expanded, would it be better to split it once or twice; that is, to divide it in two or four pieces? *A.* We think four would be the best.

(69) I. B. S., Cleveland, Ohio, asks: 1. Is it practicable to set a boiler with the end connected with the smoke stack without breeching, and fired from the side? I wish to burn shavings, and it would be much more convenient if the boiler was set in this way. *A.* Yes. 2. What is the best way to construct a damper regulator, or are there any in market? *A.* There are several in the market, one of which you will undoubtedly do better to buy than to try and make one yourself. 3. Will four cutters on a sticker or planer do better work than two, speed being the same? *A.* There would be a little advantage in the use of four cutters. 4. Will the vibration of a sticker affect its working, provided all bearings are properly adjusted? *A.* Yes.

(70) D. R., New York, writes: 1. In your answer to question No. 40, you give a receipt for a lacquer for brass work. How is this lacquer applied? *A.* Where much work of this sort is done, an oven is used in connection with the operation. It can be done, however, as follows: Polish and clean the brass; heat an iron plate, and lay the work on till it is heated just so it will not blister the lacquer. Apply the lacquer with a soft brush, and place the piece again on the iron until the lacquer is hard. 2. Can you tell me how to make and apply Holland gilt? *A.* We do not know of this by the name you give it.

(71) A. H. S., New York, writes: I have a yacht engine 8″x10″. In running with the valve wide open it works all right, but when running slow it hangs on the centers. I put on a 16″ balance wheel, but that did not seem to help matters. I then put on a 36″ propeller wheel (the old wheel was 42″), but the result was not satisfactory. The valve is said to be all right. Can you tell me what the trouble is? *A.* We can only answer in a general way that propeller engines are all more or less subject to the difficulty you refer to, the trouble being a lack of balance wheel. The 16″ wheel you put on is not large enough to make much difference with the running of the engine. If the slide valve cuts off early in the stroke the difficulty is aggravated. If you use a link to cut off with, linking up to run slow will probably have the effect to increase the lead, which will tend to further aggravation. Exactly what the trouble is can only be told after an examination.

(72) T. S. I., La Crosse, Wis., asks: What is the horse power of a slide-valve engine, cylinder 16″x36″, running at 80 revolutions and 80 pounds boiler pressure, and please tell me how you get it? *A.* To find the horse power of an engine, multiply the mean net area of piston by the effective pressure; multiply that product by the number of feet the piston travels per minute, and divide the latter product by 33,000. The quotient will be the indicated horse power. Applying this rule, you should deduct one-half of the area of piston rod to get the mean net area of piston. The area of a 16″ piston is 201″, and supposing one-half the area of the piston rod to be 3″, the mean net area of piston is 201″−3″=198″. The effective pressure can only be determined by using an indicator, but may be estimated as being 35 pounds. The piston moves six feet at each revolution of the engine, and the engine makes 80 revolutions per minute; hence the piston speed is 80×6=480 feet per minute. The indicated horse power of the engine would then be:

$$\frac{198\times35\times480}{33{,}000}=100 \text{ horse power.}$$

(73) C. C. H., Rockford, Ill., writes: The accompanying sectional view is an exact copy of a valve and seat examined by the writer a few days ago, and is drawn full size. The engine is an upright 6″x8″ cylinder, running a small grain elevator, and makes 175 revolutions per minute. The reason for sending you this item is, that the wear has taken place differently from what is usually noticed, and is the result of variable stroke of valve—the engine being provided with valve motion substantially identical with the high-speed automatic rolling mill engine illustrated in your journal of the 28th ult., and detailed in your issue of Feb. 4th. The engine spoken of has done but light duty, and only run at intervals for three seasons, so there seems to be no good reason for its present condition aside from the automatic regulator adopted. The dotted line indicates the original surface of valve seat. The valve was too much worn to determine how much had been cut away from it, but since it was, as a matter of course, straight when made, it is readily seen that a greater amount is worn away than is shown by the curves of its face, it having less surface than the valve seat. Having but limited practical knowledge of the behavior of this class of engine regulators, I wish to ask how far this may prove a rule with them, or whether it is an exceptional case of wear, and one which will not be repeated generally in the later designs of variable stroke eccentric engines? *A.* This may safely be taken as an exceptional instance of wear, for which there are probably several causes. The valve and seat may have been soft, or the engine may have been run with high-pressure steam, and without cylinder lubrication; or the boiler may have foamed, and the water have been dirty, etc. Any or all of these causes would account for the rapid wear of valve and seat. The reason for valve and seat wearing in the manner shown is because of the short travel, owing to light load. The principal trouble, however, is that the valve is unbalanced against pressure towards the seat. Nearly all builders of automatic slide-valve engines, in which there is a variable valve travel, balance their valves, which reduces the wear to nearly nothing, and obviates the trouble so clearly shown by the sketch.

BUSINESS SPECIALS.

Transient advertisements 50 cts. a line for each insertion under this head. About seven words make a line. Should be received Wednesday morning.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N.J.

James W. See, Consulting Engineer, Hamilton, O.

Presses and Dies. Ayar Mach. Works, Salem, N. J.

Alfred Wilkinson, Expert Tests of Steam Engines and Boilers, 123 N. 4th St., Phila.

Latest and best books on Steam Engineering. Send stamp for Catalogue. F. Keppy, Bridgeport, Ct.

Steel name stamps, 15c. per letter; steel figures, $1 per set. W. G. Sackman, 59 Vine St., Cleveland, O.

List of Machinists in U. S. and Canada; just compiled. Price $10. A. C. Farley & Co., Philadelphia.

Foot Power Machinery, for workshop use, sent on trial if desired. W. F. & John Barnes, Rockford, Ill.

"To stop leaks in Boiler Tubes use Quinn's Patent Ferules. Address, S. M. Co., South Newmarket, N. H."

"How to Keep Boilers Clean," and other useful information for steam users and engineers. Book sent free by the publisher, Jas. F. Hotchkiss, 84 John Street, N. Y.

Russell & Struthers, Wax Process for making outline engravings. Specimens each week in the AMERICAN MACHINIST. We also do Map Engraving with best facilities. Russell & Struthers, 59 Park Place, New York.

"Slide Valve Gears," by Hugo Bilgram, published by E. Claxton & Co., Phila., describes the easiest method known for correctly proportioning slide valves, link-motions and cut-off gears; price, $1.00.

The J. N. Mills Publishing Co., 165 Broadway, N. Y., publishers of Steam Users' Business Directories for the New England States, 1880, New York and New Jersey, 1881, have in course of preparation their edition for PENNSYLVANIA and OHIO for 1882. Intending subscribers or advertisers for above work please address us early for circular and prospectus.

"Sibley College of Mechanic Arts, Cornell University.—Entrance examinations will be held June 12th and September 11th, 1882. For the register and catalogue just issued, containing reorganized courses of instruction, scientific and practical, including draughting, machine construction, general shop work, etc., apply to the President of Cornell University, Ithaca, N. Y."

"Useful Information for Steam Users." A 100-page *Illustrated Pamphlet*. Contains interesting data on the care and management of Steam Boilers, and rules for engineers and firemen. Engineers everywhere should have this work. Sent for 25 cents in P. O. Stamps. The J. N. Mills Publishing Co., 165 Broadway, N. Y.

"Patent Binder" for the AMERICAN MACHINIST holds 52 weekly issues in good shape. Sent to any address by mail for one dollar. We can furnish Volume 3 of the AMERICAN MACHINIST, containing the full 52 issues of 1880, neatly bound in cloth, ready to ship by express, for four dollars. Unbound, three dollars. AMERICAN MACHINIST PUBLISHING CO., 96 Fulton Street, New York.

Ealy's "Blue Book,"—Special classified list of Machinists, Machinery, Railway, Engine and Boiler Makers supplies, etc., with financial standing and paying qualities of all dealers and manufacturers. Much more convenient and reliable than any other work of the kind published. We also furnish full detailed written reports. Price $30 to July 1, 1882. The JOHN W. EALY COMPANY, 51 Chambers street, New York or 79 Dearborn street, Chicago, Ill.

"Extracts from Chordal's Letters," the most interesting mechanical book published. A great variety of mechanical and business topics treated in a wise and witty way that will be instructive to old and young mechanics, and interesting to everybody. As many as 150 copies have been sold in a single shop. Over 40 Humorous illustrations; 320 pages, 12 mo. Price, $1.50 per copy, by mail, to any address. AMERICAN MACHINIST PUBLISHING CO., 96 Fulton St., New York.

MANUFACTURES.

The new Pullman car shops at St. Louis are completed.

Manchester, N. H., Locomotive Works run twelve hours a day.

Extensive bridge building shops will probably be erected in St. Louis, shortly.

It is proposed to locate the Fontaine Locomotive Works at Indianapolis, Ind.

Fort Madison, Ia., has released from taxation all the new manufacturing enterprises which start there.

The New York, Lake Erie & Western railroad have a fifteen-stall brick round-house well under way at Elmira, N. Y.

An appropriation of $12,000 was voted to the Chicago & Atlantic road in order to secure their machine shops at Huntington, Ind.

Battle Creek, Mich., has given the Grand Trunk R. R. $25,000 and 25 acres of land in consideration of the company's locating its repair shops there.

Furness Bros., Chicago, Ills., are building forty Gould patent nail-plate machines for the Riverside Iron Works, Wheeling, W. Va.—*Industrial World.*

Louis Snider's Sons are remodeling their paper mill at Hamilton, Ohio. They will replace their old engine with an Atlas Corliss of 100 horse power.

The new Indianapolis Steel Rail Mill will put in seven new boilers 48″ diameter, 28 feet long, to be furnished by the Atlas Engine Works, Indianapolis.

So far the amount of capital stock pledged to the proposed locomotive works at St. Louis aggregates $250,000, several parties subscribing as much as $25,000 each.

Valley Machine Co., Easthampton, Mass., are building two of their largest steam pumps for parties in northern New York, as protection against fire in their mills.

The Canada Iron & Locomotive Company are to receive a bonus of $500 a year for ten years from the town of Hochelaga, Canada, provided 100 men are regularly employed.

One of the latest adaptations of celluloid is for making lithographic "stones." The Celluloid Novelty Co., 313 Broadway, N. Y., claim this substance to be superior to lithographic stone.

Critchley & Whalley, Portsmouth, N. H., are experiencing a good demand for their expanding reamers. They have put up a new foundry building 40x65 feet, and started to make castings.

Bradley & Co., of Syracuse, N.Y., have completed the new addition to their works. This addition is 80x175 feet, and four storied. The works are now employing 200 men, and running two-thirds overtime.

The capital stock of the Lynchburg, Va., Foundry and Machine Company ($60,000) has all been subscribed. Lynchburg exempts new manufacturing establishments from taxation for twenty-five years.

Dwight Slate, Hartford, Conn, writes us: My Sensitive Drills are going like hot cakes. I have fifty in the works. Our advertisement pays first rate, and brings in trade directly, to say nothing of the sales it results in indirectly.

Sidebotham & Powell, Frankford, Phila., have recently made an 80x42ft. addition to their boiler shop and propose to enlarge their machine shop. A pair of shears and punches from Manchester, England, were placed in the new addition.

The Brooklyn & San Miguel Mining & Reduction Co., have ordered a complete steam outfit from the Atlas Engine Works of Indianapolis, consisting of a 14″x30″ Atlas Engine, with a pair of 40″x18 ft. boilers, for their mines at Columbia, Colorado.

James Mahony, 109 Liberty Street, New York, writes us: Since December, '81, have applied thirty Universal Patent Furnaces; am now filling second order from Gutta Percha and Rubber Co., Brooklyn, and two for M. Crane, W. 39th Street, City.

Ira Parker, Littleton, N. H., has the largest manufactory of buck gloves in the world. Two hundred and fifty hands are employed in the shops besides more than two thousand women making gloves at home. The shops have lately been enlarged to quite an extent.

W. F. & John Barnes, Rockford, Ill., began the manufacture of foot and power machinery for wood and iron work in 1871, their works being run by water power. They now employ 65 men, with a pay roll of about $35,000 a year, and use yearly 75 tons of coal and 300 tons cast iron.

The Columbia Iron Foundry and Machine Works, Chicago, Ills., are adding to the machinery department a large quantity of machinery and tools. They employ 175 men and work up 6000 tons of castings annually. Their specialty is the building of heavy lathes, planers, etc., for the various railroads.—*Industrial World.*

The Yale Lock Manufacturing Co., Stamford, Conn., have purchased of John A. Wilde, 76 Cranberry Street, Brooklyn, N. Y., shop rights of the two expanding mandrels illustrated in the AMERICAN MACHINIST. Mr. Wilde contemplates arrangements by which the manufacture of these mandrels will be commenced shortly.

The Straight Line Engine Company, Syracuse, N. Y., write us: Although we have been building our small engines in lots, and without either advertising or soliciting orders, this is the first time we have been able to get an engine finished before it was sold. We have had lots of offers for engines of larger sizes at our own price, but have been unable to fill them.

Hall & Brown, manufacturers of wood working machinery, have acquired such an extensive business that an enlargement of their present quarters is called for. Bids are being received for a 40x97 foot addition, two stories high, to their present shops. The force of workmen will be enlarged, and new and additional machinery put in.—*St. Louis Age of Steel.*

Grant & Bogert, Flushing, L. I., are about bringing out a new 22″ engine lathe having a number of novel features. Amongst others, the bed is peculiarly cross ribbed, and extended down at the two sides in the form of a curve to obviate the tendency to spring, both from its own weight, and from the thrust of the tool while in operation. The firm are driven with work, and are constantly adding more tools and men. They have their foundry in operation, and are making remarkably fine castings, using moulding sand obtained on the premises, and which is of exceptionally good quality.

In a recent issue it was stated that a gold medal was awarded the Deane steam pump at one of the Boston fairs, which, upon later information (as per report of Judges), resolves itself into a silver medal. The Judges reported as follows: "The upright pump has the steam cylinder attached to a post, so that it can be swung off, to enable the pump rolls to be withdrawn. It is apparently a new arrangement, and efficient for the purpose. This exhibit has with it the evidence of good proportions, careful construction and excellent workmanship. No rival or competing exhibit has been made; consequently the judges have no comparisons to make within their scope. The outside appearance is about the same as other direct action steam pumps in the market. Any statement of superiority by the inventor or constructor, under such circumstances, is to be entertained only after the best and most reliable tests and the evident fact."

Machinists' and Engineers' Supplies.

NEW YORK, Feb. 16, 1882.

This week goods are coming in more freely from the manufacturers than last week, although not so freely as desired. Prices continue stiff, and many of the dealers are making an effort to secure a full line of goods for the Spring trade.

The Cohoes Iron Foundry and Machine Company, Cohoes, N. Y., have issued a new Catalogue and Price List of Specialties and Supplies for mills and shops. This book contains 72 pages of carefully arranged advertisements and condensed price lists of houses in the supply line, and is intended as a book of reference for offices and shops. The book has an index of the full address of dealers and manufacturers, also one of machinery, so that it may be a mutual help to the manufacturer, dealer and consumer.

George F. Perkins & Co., Minneapolis, Minn., have issued a new circular and price list of the Perkins Jack Screws. These Jacks differ from others inasmuch as they have a stop upon the screw which prevents them from being run out too far, thereby injuring, or spoiling the threads.

Iron and Metal Review.

The Pig Iron market presents the same quiet appearance as reported last week. Consumers seem to be holding off in anticipation of lower prices and only buy sufficient quantities to supply their immediate wants. Although prices have but slightly changed since our last report it is known that large quantities can be bought much less than present quotations.

We quote Foundry No. 1 at $26 to $27; Foundry No. 2 X, $24.50 to $25; Gray Forge, $23 to $24. The market for Foreign Iron is quiet, and prices are unchanged, but it is easier to buy than last week as the supply is coming in more freely.

We quote Gartsherrie at $26.50 to $27; Coltness, $27.50 to $28; Glengarnock, $26 to $26.50 Carnbroe, $25; Eglinton, $24.50 to $25; Summerlee, $27.

Prime Wrought Iron Scrap in moderate demand, at $32.50 to $33 from yard. Merchants' Bar Iron is quiet, in view of an expected advance in prices.

Steel and Iron rails quiet with no change in prices. Old rails dulll at $30.50 for Tee's, and $31 50 to $32 for Double heads.

The Copper market is rather irregular owing to the very light demand. We quote Lake Superior at 19c. to 19¼c. Banca Tin, 28¾c. to 28½c.; Straits and Malacca, 25c. to 25¼c. Australian and Billiton, 25¼c.; Spelter, Western, 5¾c. to 6c. Refined, 8c. to 8¼c. Silesian, 5¾c. Lead, 5¼c. Antimony, 12¾c. to 14½c.

WANTED

"Situation and Help" Advertisements, 30 cents a line, each insertion. About seven words make a line. Should be received Thursday morning.

A Mechanical Draughtsman desires re-engagement. Address "H," P. O., D. 38, New Haven, Conn.

Pattern Maker Wanted—A good workman, if a steady and reliable man, can find a good situation with the Concord Axle Co., Fisherville, N. H.

A large manufacturing firm desires a first-class draughtsman, who has made a specialty of engine work. Address, with qualifications, Box 3242, Boston, Mass.

Wanted—By a pattern maker, one who can make any kind of patterns, and can do any kind of mechanical drawing. Address H., care of Bocklen, Goshen, N. Y.

Wanted—A foreman to take charge of a large machine shop occupied with heavy work, and employing about two hundred hands. Address, with references, Shumway, Burgess & Co., Chicago, Ill.

Wanted—Foreman for Machine Shop; must have experience and capacity to handle one hundred men, accustomed to Engine work and shop regime. References required. Address, A. W. H., Middletown, O.

Machinist Wanted—A rare chance, if applied for soon, for a first-class, thorough going, practical machinist, with from $1,500 to $3,000 capital to invest. Address, W. E. S., Box 1, AMERICAN MACHINIST Office.

Wanted—Four or five good planer hands to work on iron planers. State age and wages required. Also, three or four apprentices for four years' apprenticeship. Minors preferred. State age. Written contract with parent or guardian required. Address The Hendey Machine Co., Torrington, Conn.

A first-class machinery man is open for an engagement. Has large experience as salesman, buyer, correspondent or manager, and can fill any or all of above positions. Unquestionable references. Correspondence is solicited from any in want of a reliable man in the machinery business. Address Box 15, AMERICAN MACHINIST.

Wanted—Light work by contract, or by the day. Model making, metal patterns, etc. E. R. Brown, Windsor, Ct.

TO INVENTORS.

We will pay two thousand five hundred ($2,500) dollars for a practical and inexpensive arrangement of locomotive fire boxes, to burn Brown coal or Lignite of following properties: A specific gravity 1.33, ash 6.505 per cent., sulphur 2.88 per cent., hydro-carbons, hydrogen and oxygen 90.555 per cent. Its yield is 6¼ to 7 feet to the pound.

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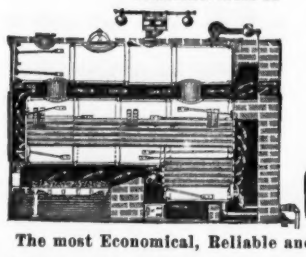

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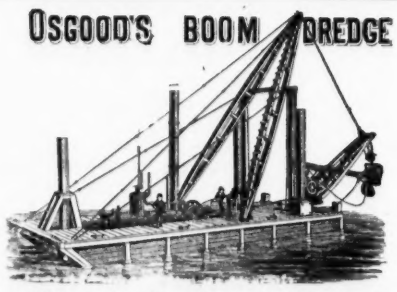

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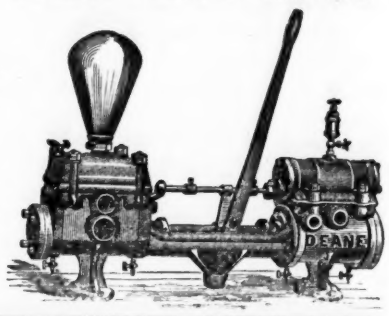

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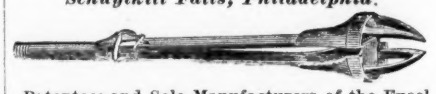

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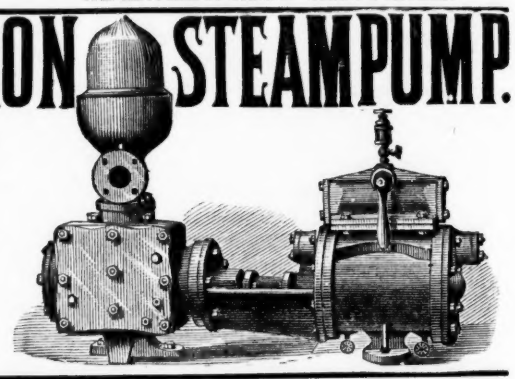

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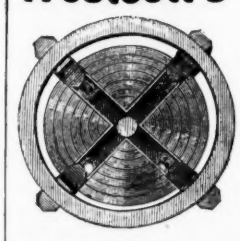

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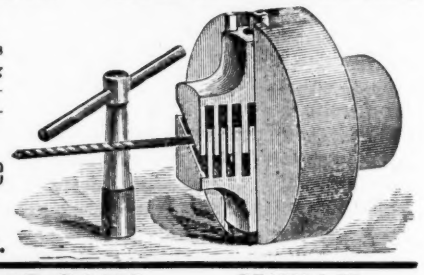

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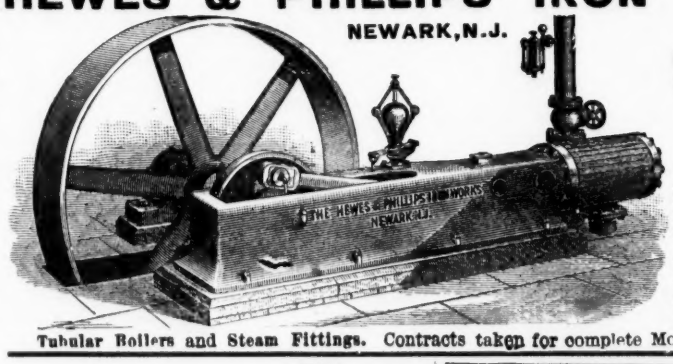

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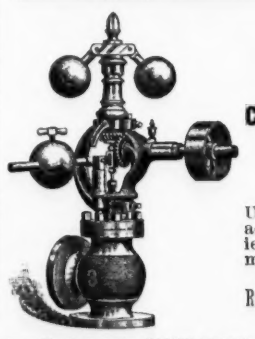

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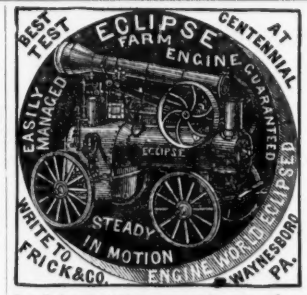

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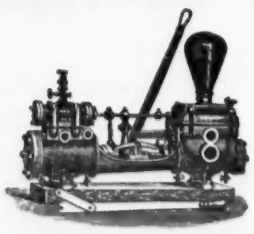

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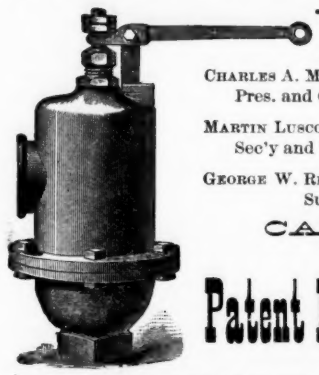

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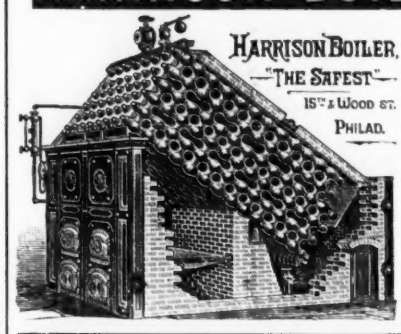

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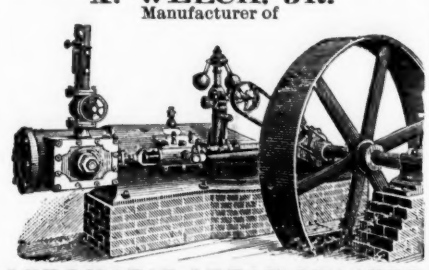

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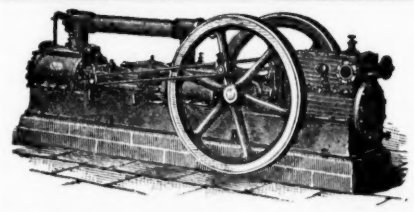

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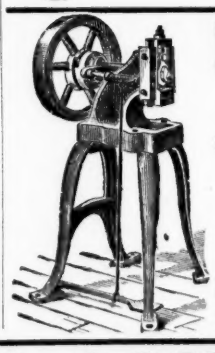

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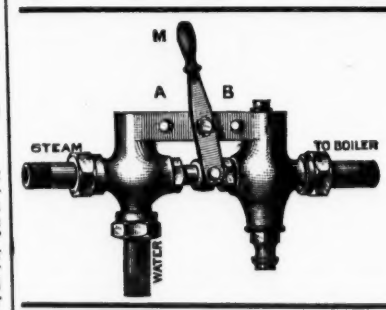

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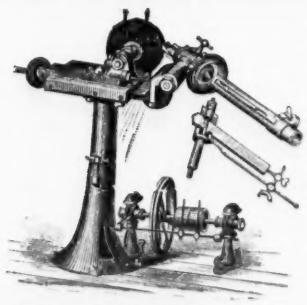

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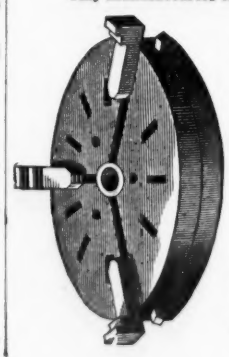

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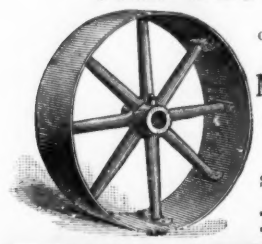

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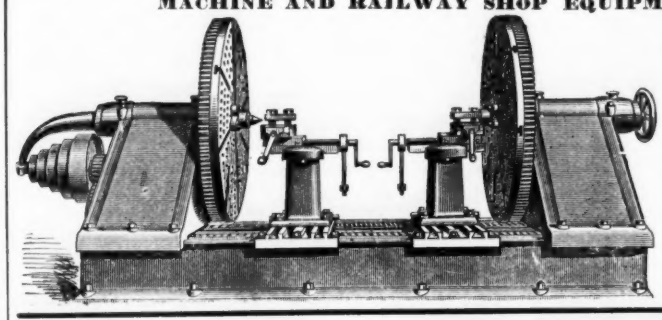

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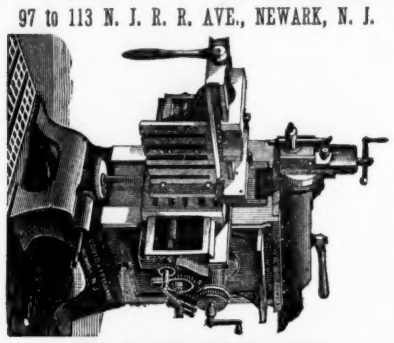

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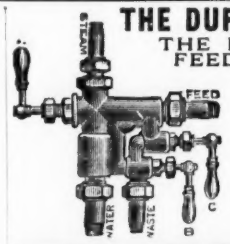

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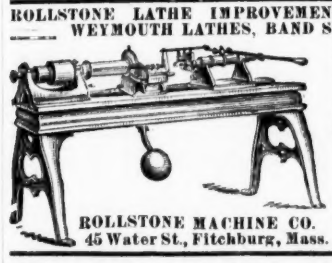

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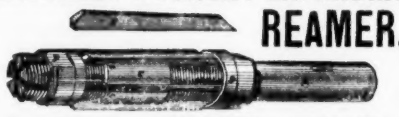

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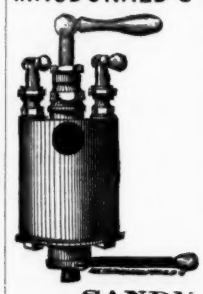

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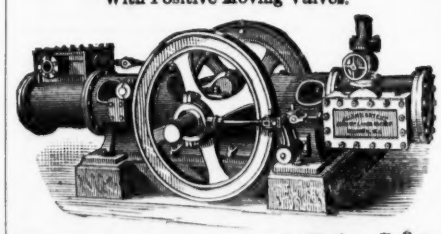

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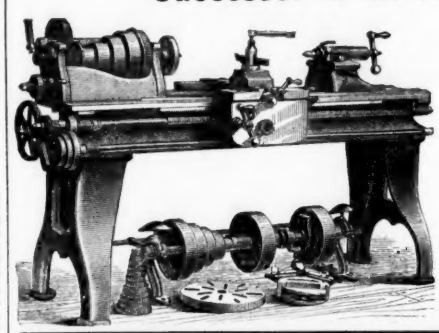

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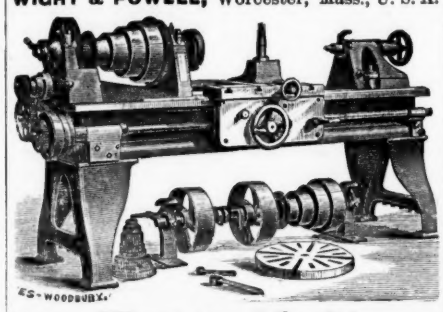

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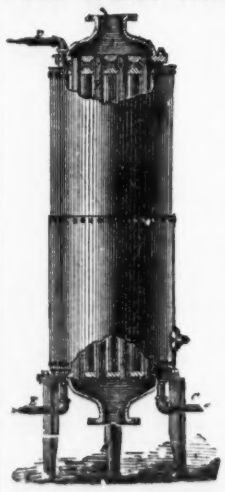

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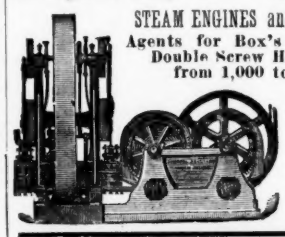

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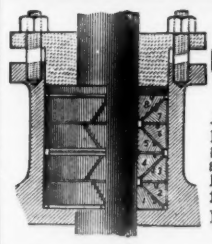

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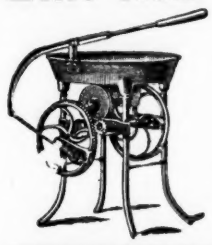

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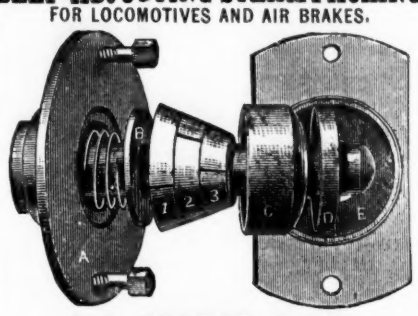

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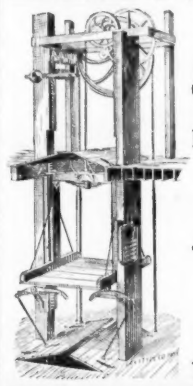

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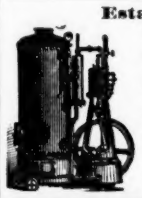

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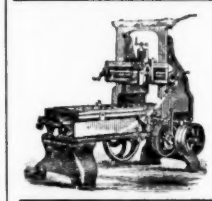

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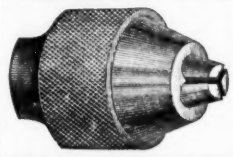

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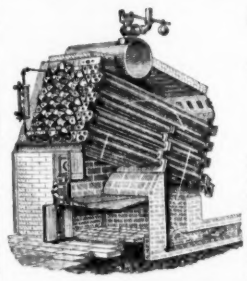

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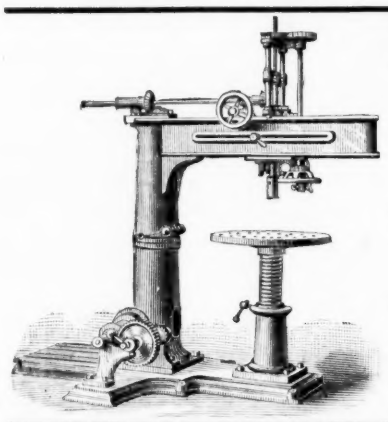

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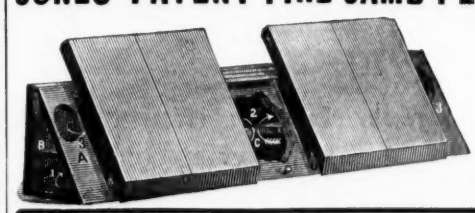

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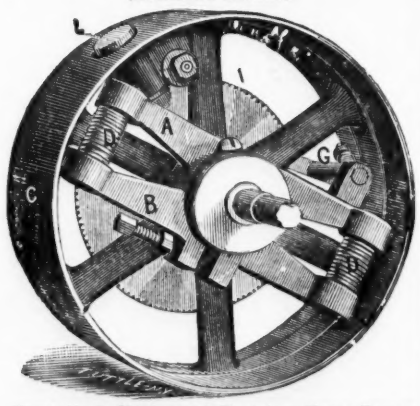

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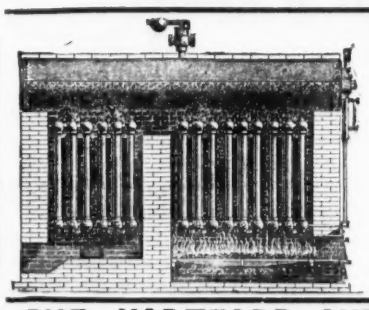

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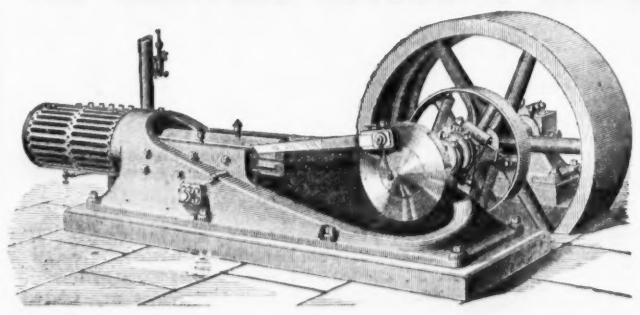

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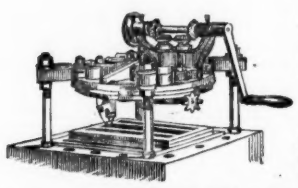

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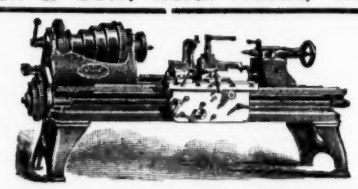

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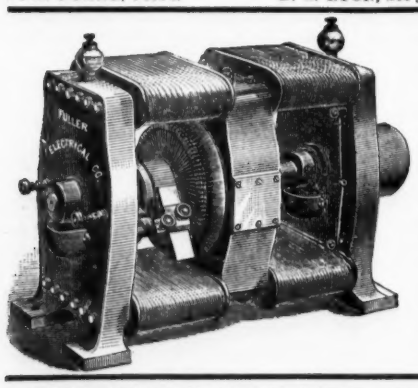

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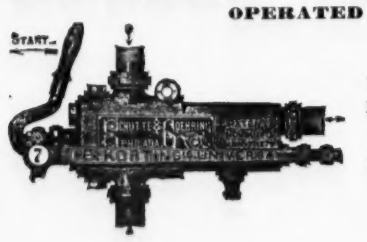

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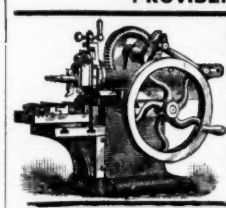

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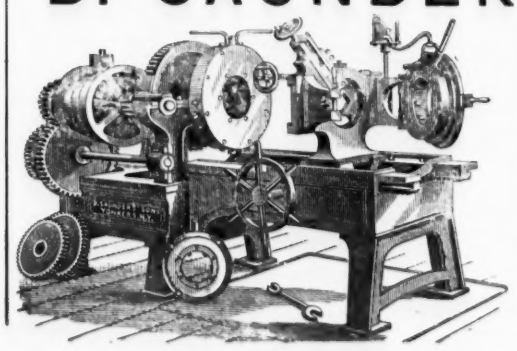

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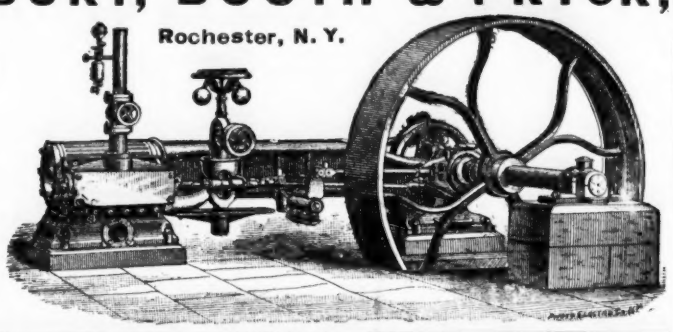

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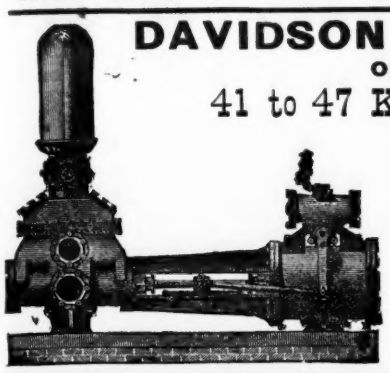

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Working without Boiler, Steam, Coal, Ashes or Attendance.

Started Instantly by a Match, it gives full power immediately.

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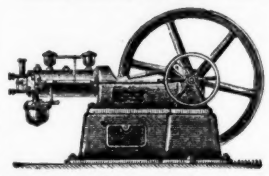
No explosions; No Fires nor Cinders; No Gauges; No Pumps; No Engineer or other attendant while running.



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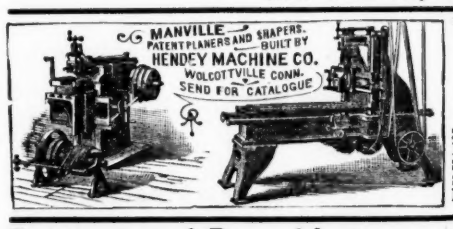

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Manville Patent Iron Planers and Shapers.

15 in. Shapers, 24 in. Shapers, 3½ ft. x 16 in., 5 ft. x 20 in., 6 ft. x 24 in., 8 ft. x 24 in. Planers, Amateurs' Hand Planers, with chuck and centers, Hollow Steel Spindle Hand Lathes, Brass and Wire Slitters, Spring Chuck, and Common Clock Lathes. Catalogue gives many names of users of our tools.

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One Engine Lathe, 36 in. x 15½ ft. A1 order.
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One " " 28 in. x 12 ft. " "
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One " " 24 in. x 12 ft. Fifield. New.
One " " 24 in. x 10 ft. " "
One " " 24 in. x 10 ft. New Haven.
One " " 20 in. x 14 ft. Fifield. New
One " " 20 in. x 12 ft. Ames. New.
One " " 20 in. x 10 ft. " "
One " " 20 in. x 8 ft. " New.
One " " 18 in. x 9 ft. Whitc'b. Good order.
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One Engine Lathe, 16 in. x 6-7-8 ft. Bridgeport Mch. Tool Works. New.
Six Engine Lathes, 16 in. x 6 ft.-7ft. x 8 ft. Ames. New.
One " " 15 in. x 8 ft. Pratt & Whitney.
One " " 15 in. x 6 ft. Flather's. New.
Three " " 14 in. x 6 ft. Star Tool Co. New.
One " " 14 in. x 6 ft. Hand. New.
One " " 13 in. x 6 ft. Ames. New.
One " " 13 ft. x 4½ ft.
One " " 12 in. x 6 ft. Lincoln.
Two " " 11 in. x 5 ft.
One Hand Lathe. 12 in. x 5 ft.. Hendey. New.
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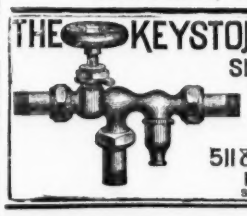

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NEW MACHINE SHOP TOOLS.

List of Sizes for Quick Delivery.

Screw Cutting Engine Lathes						Iron Planers.	
20 in.	swing,	8 ft.	bed.		Powell.	22 in. x 20 in. x 4 ft.	Wheeler.
20 "	"	10	"	"	"	24 in. x 24 in. x 6 ft.	Hendey.
20 "	"	12	"	"	Ames.	24 in. x 24 in. x 6 ft.	Whitcomb.
21 "	"	10	"	"	Blaisdell.	26 in. x 24 in. x 6 ft.	Gleason
20 "	"	14	"	"	Powell.	26 in. x 24 in. x 7 ft.	"
24 "	"	12	"	"	Fifield.	24 in. x 24 in. x 8 ft.	Ames.
24 "	"	16	"	"	Blaisdell.	26 in. x 26 in. x 8 ft.	Pond.
26 "	"	16	"	"	Niles.	27 in. x 27 in. x 8 ft.	Whitcomb.
30 "	"	23	"	"	Ames.	28 in. x 28 in. x 6 ft.	Gleason.
32 "	"	26	"	"	Gleason.	28 in. x 28 in. x 8 ft.	"
36 "	"	16	"	"	Fitchburg.	30 in. x 30 in. x 8 ft.	Whitcomb.
36 "	"	20	"	"	"	30 in. x 30 in. x 8 ft.	Fitchburg.
40 "	"	16	"	"	Gleason.	36 in. x 36 in. x 12 ft.	Gleason.
50 "	"	20	"	"	Fitchburg.	42 in. x 42 in. x 16 ft.	"

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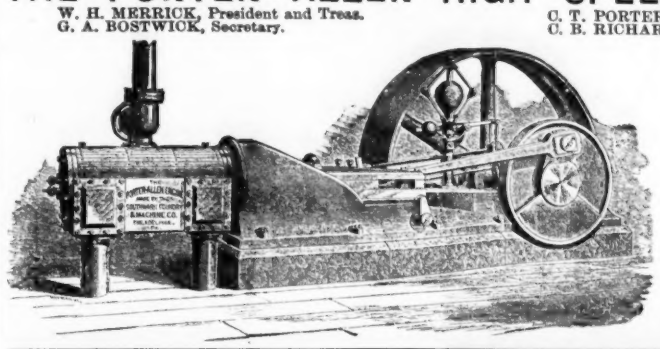

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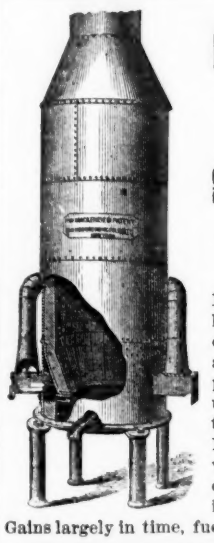

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Differs from all others in having a continuous tuyere. Blast enters fuel at all points, causing complete diffusion of air, and uniform temperature throughout the furnace. Melts 10 to 15 tons an hour with blast pressure required to melt 2 or 3 tons in an ordinary cupola. Gains largely in time, fuel and quality of casting.

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Teeth cut diagonally. Grips Round Iron or Pipe.

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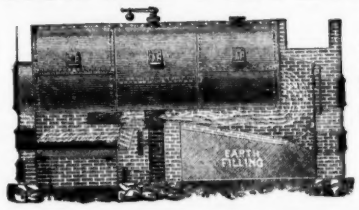

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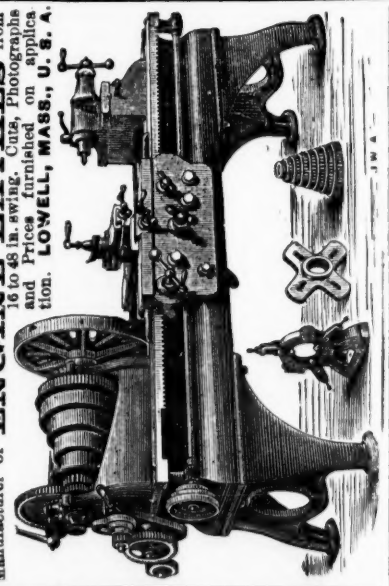

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2 30 in. x 30 in. x 8 ft. Planers. New. March.
2 26 in. x 26 in. x 6 ft. " " "
2 30 in. swing, 15 ft. bed. Engine Lathes. March.
1 22 in. swing, 13½ ft. Bed Engine Lathes. "
3 18 in. " 10 ft. " " "
3 18 in. " 8 ft. " " "
4 11 in. " 5 ft. " " "
2 30 in. " Upright Back Geared Drills. "
2 9 in. Shapers. New. March.

The following in store:

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1 19 in. " 6 ft. " " 2d-hand.
2 19 in. " 10 ft. " " New.
2 19 in. " 8 ft. " " "
1 18 in. " 8 ft. " " "
2 15 in. " 5 ft. " " "
1 17 in. " 6 ft. " " 2d-hand.
1 17 in. " 7½ ft. " " "
1 15 in. " 15 ft. " " "
1 1¾ in. " 4 ft. " " "
1 15 in. " 9 ft. Hand Lathe. New.
3 12 in. " 6 ft. Bed Hand Lathe. New.
1 10 in. " 4½ ft. " " "
1 38 in. swing Pulley Lathe, new.
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1 38 in. Swing Upright Drill. B. G. & S. F. New.
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2 20 in. Upright Drills. Back Gear. New.
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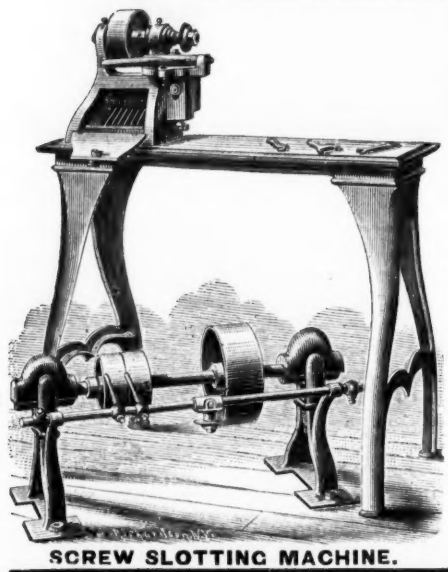

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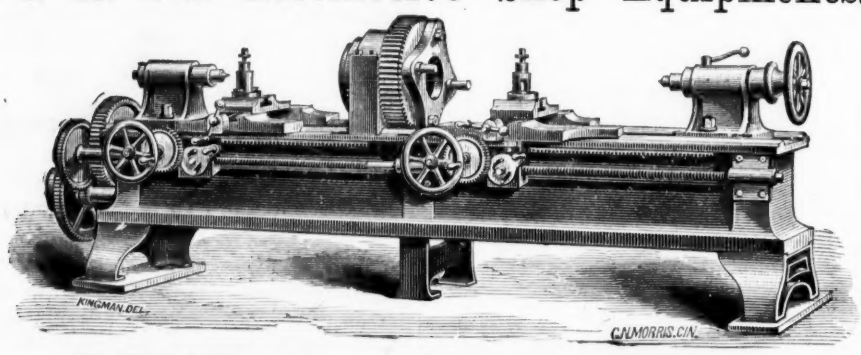

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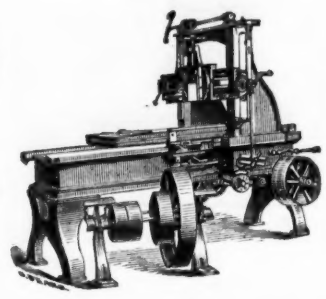

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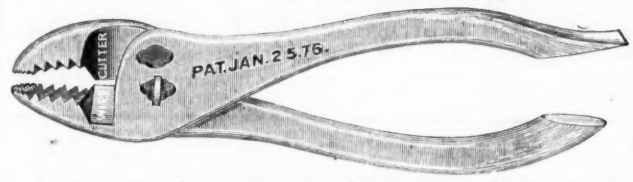

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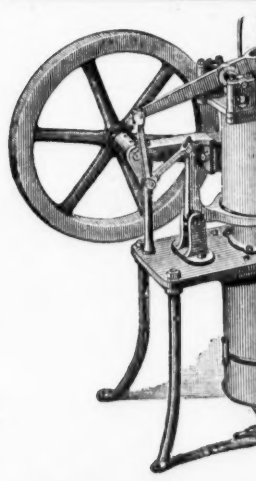

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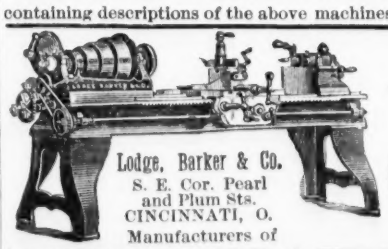

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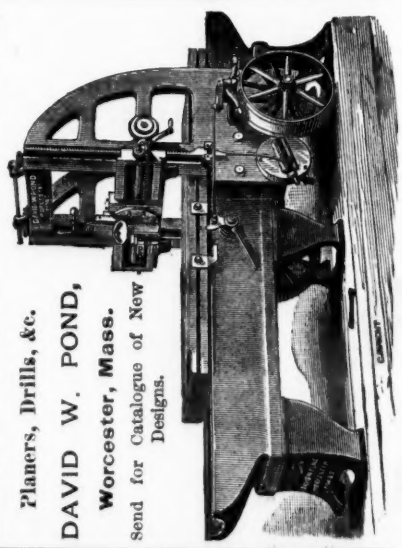

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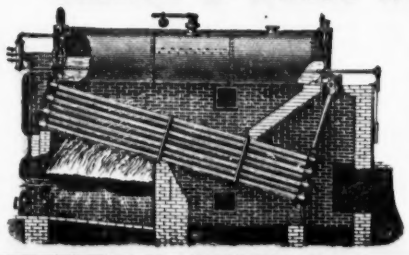

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